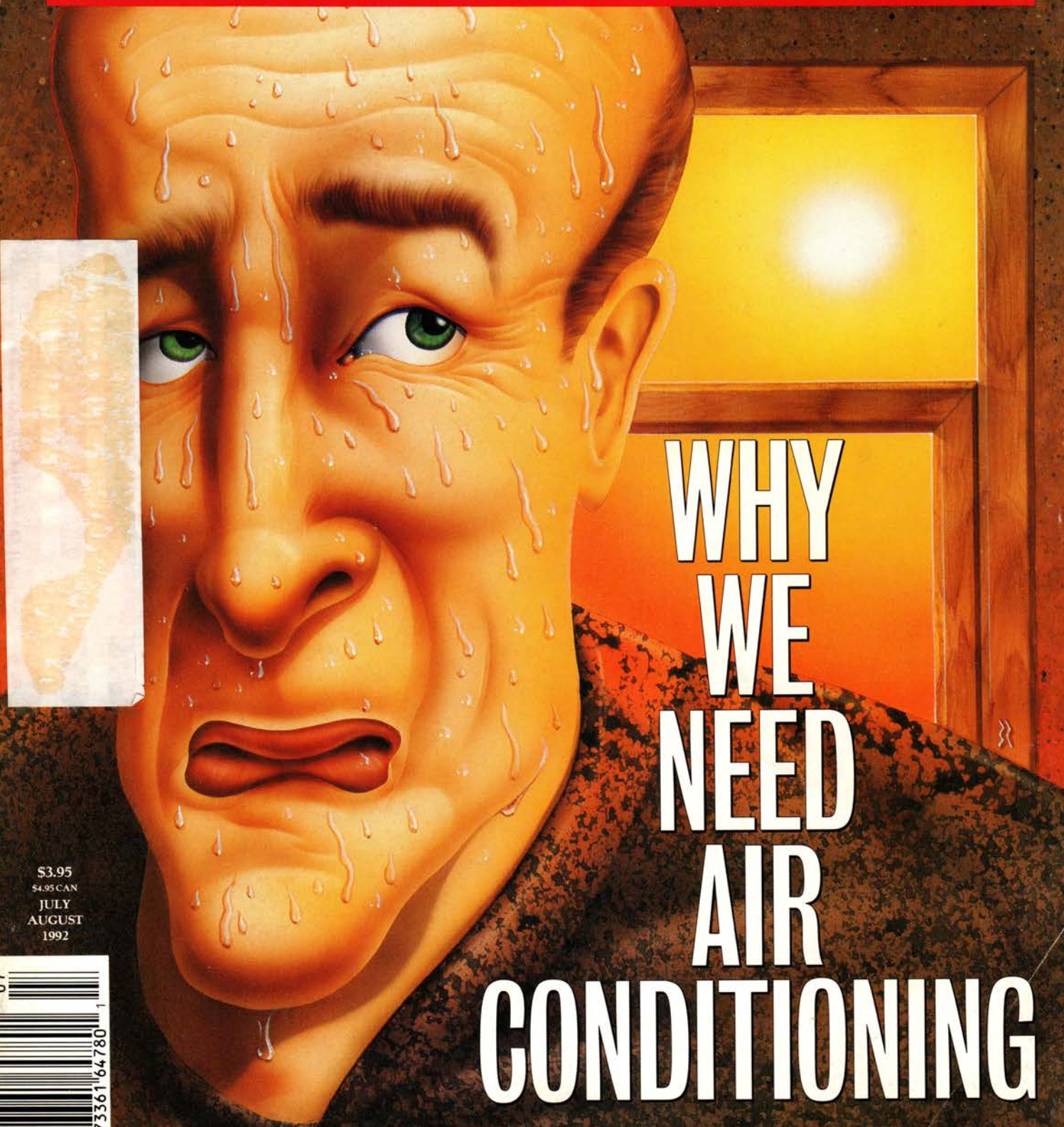


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GARBAGE

THE PRACTICAL JOURNAL FOR THE ENVIRONMENT



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Arizona Rathje Rides Rough

EVER SUSPICIOUS OF HISTORICISM, CULTURE, AND IVORY-tower pursuits, America has bestowed little honor on the archaeologist, who must be concerned with all three. He is a bookworm, we've imagined, unappealingly focused on the past, patient to the point of neurosis with his obsessive sorting and his compulsive labeling.

Then, in recent years, along have come two larger-than-life figures: cowboy-types blasting away at our stereotypical image of what an archaeologist is like. One of these guys is Indiana Jones. The other is Bill Rathje.

The woman who called her magazine *GARBAGE* couldn't wait to meet the man who called his career the Garbage Project, so I had dinner with Bill Rathje last year in Los Angeles. He's a talker, an endlessly curious wit; I was in his thrall by the time the salad came. His stories (about garbage!) are a chronicle of human quirkiness. He's taken the facts — about what people buy and eat and say — and found the connections, which he can't wait to share with you. It felt like the frustrated anthropology major (me) had seen what her parallel life could have been like, were she as brilliant. I struggled to hold up my end of the conversation, first with Bill the psychologist, then Bill the statistician, then Bill the stand-up comic.

Some months later Dr. Rathje agreed to pen a column in this magazine. It is, more than any other page, the place where we get beyond prosaic non-issues like sludge and plastics to focus on the really messy stuff: human attitudes and behaviors, in all their wonderful perversity.

So I already knew that Bill Rathje is a good storyteller. It was no surprise that I couldn't put down his new book. I want you to read it, too. It's called *Rubbish! The Archaeology of Garbage*.

The book, which Rathje wrote with *Atlantic Monthly* editor Cullen Murphy, sets the scene with a quick history of garbage. Thus do we gain perspective for the next section, a candid and sometimes funny chapter entitled "What We Say, What We Do." (We drink more alcohol than we admit, and we eat less fiber.) The account of actual landfill excavations follows; it is myth-busting and more pertinent to you and me than it sounds. Specific issues get their due: What is in garbage? What about diapers? technology? recycling? Rathje and Murphy close with an ironic chapter on "life-style override" and, finally, ten commandments for future trash management.

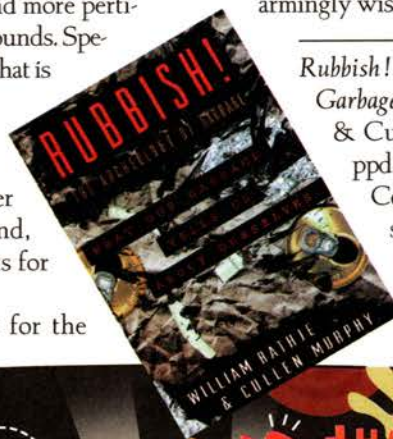
This is not a book for the

squeamish. I don't just mean that it describes landfills in gory detail ("[meat] packaging is bathed in blood and in a kind of clear slime . . . the 'meat diaper' drips sanguinary rivulets on the garbage sorter's aprons."). I mean the book is not for the politically squeamish. If you are one who feels that disposable diapers should be outlawed for their "symbolic value" as garbage, it will irk you to read Rathje's dismissal of them as a big problem.

But if you've managed to hold onto an open mind through all the propaganda, if you like a good read about human nature, then settle down with *Rubbish!* (And if you're in a position to make waste-management decisions, you gotta read it.)

Thank you, Bill, for a disarmingly wise piece of work. ☛

Rubbish! The Archaeology of Garbage by William Rathje & Cullen Murphy, \$26 ppd. Order from HarperCollins, Orders, Keystone Industrial Park, Dept. GM, Scranton, PA 18512; (800) 331-3761.





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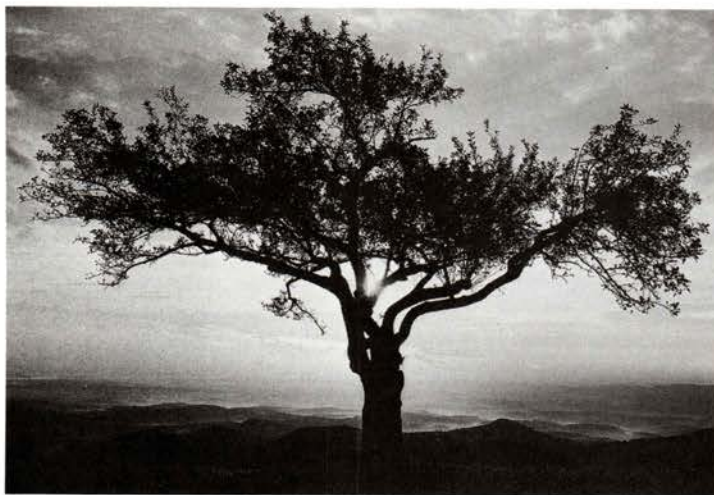
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WE'VE HELPED OVER 600 COMMUNITIES PROTECT THE ENVIRONMENT.



It's a fact. American homes contain dozens of household waste products. A lot of that seemingly harmless stuff we've got lying around the garage, basement and under the kitchen counter is dangerous hazardous waste. It is estimated that the average household contains ten to fifteen gallons of waste materials.

Many concerned community groups and city leaders are actively seeking ways to organize collection programs to prevent household hazardous wastes from finding their way into local sanitary landfills and water resources. That's why more and more communities are calling Laidlaw.

Laidlaw Environmental Services is one of the nation's largest organizations committed to the effective management, transportation and disposal of household hazardous waste. Across the nation, we've helped create responsible

community partnerships to educate people about the dangers of household hazardous waste. We've also organized and participated in hundreds of waste collection programs.

So, if your community is thinking about organizing a household hazardous waste collection program, or if you'd like to know more about how Laidlaw Environmental Services can help, call 1.800.356.8570. Our Manager of Household Hazardous Waste is available to answer all your questions about conducting a waste collection program in your community.

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Nukin' the Radwaste Debate

WE WERE PLEASED TO SEE the growing controversy over the nation's longest-lived and most ultra toxic waste featured in your March/April issue ("Dismantling Nuclear Reactors"). The nuclear industry is opening the doors of its waste buildings, and huge reservoirs of stored-up materials are flooding into the public domain.

In the case of the Fort St. Vrain reactor, whose dismantling is featured in your article, we've followed the planning of this procedure very closely at Nuclear Regulatory Commission headquarters over the past two years, and we can say for sure that it's going to be an extremely hazardous undertaking. Offsite shipments of "spent" fuel from Fort St. Vrain have been repeatedly blocked by the state of Idaho, and the issue remains unresolved in federal court. But 500,000 cubic feet of "low"-level nuclear waste will also have to be shipped to Washington state, and one million gallons of water will be required to flush over 100,000 curies of tritium — radioactive

hydrogen — from the plant's interior into the surrounding environment. We think eastern Colorado should become better informed about what's in store at Fort St. Vrain.

KEMP HOUCK
Editor, Atoms & Waste
Tacoma Park, Maryland

BILL BREEN'S ARTICLE "Dismantling Nuclear Reactors" perpetuates two damaging myths about atomic energy. Mr. Breen parrots the nuclear power industry's disingenuous claims that atomic power can help solve the twin problems of foreign-oil dependence and global warming.

Greater reliance on atomic power would only slightly affect U.S. foreign oil dependence. Less than five percent of our country's total annual oil consumption goes toward generating electricity (the only type of power which nuclear reactors can produce). Most of the oil which is used to generate electricity is residual, trash oil. It has few other uses and would probably still be used to generate electricity regardless of any additional nuclear capacity.

As for the idea of using atomic power as a panacea for global warming, a nuclear solution to global warming would be impossibly expensive. Nuclear power is literally the most expensive and dangerous way to boil water. Our government has propped up the nuclear power industry with subsidies of up to \$15 billion per year. Even so, nuclear power today provides us with a paltry 8.2 percent of our energy. In light of these expenditures, nuclear power's actual contri-

butions to carbon dioxide displacement have been exceedingly small. And, as Mr. Breen's article on nuclear decommissioning helps demonstrate, many of the costs of nuclear power are still looming.

For more comprehensive information on these garbage claims for nuclear power, contact Greenpeace at 1436 U St. NW, Washington, DC 20009.

PETER GRINSPOON
Energy Campaign
Greenpeace USA
Washington, DC

Bill Breen responds:

While Idaho has blocked shipments of Ft. St. Vrain's spent fuel, the Colorado utility that owns the plant is housing the stuff on-site (for up to 40 years) in an innovative dry-storage facility. Even many critics of nuclear power agree that dry storage is safer than racking fuel in conventional, water filled pools.

As for Greenpeace, thanks for joining in. Two things, though: We'd welcome Greenpeace's comments on the story's real subject — what to do with the radioactive waste from retired reactors. Also, citing isn't parroting.

Bioregional Blues

IT WAS UNFORTUNATE THAT your otherwise informed and engagingly written article "Being Bioregional" (March/April) included Kirkpatrick Sale's dismissal of Green City efforts. Your readers were given a minority negative opinion [regarding] an important movement of resident bioregional activists, from San Francisco, Portland, and Santa Fe to Chicago, Philadelphia, and

even Mr. Sale's New York. All cities are situated within bioregions, and most of the human population lives in urban areas. Green City Programs guide individual practices and government policies in positive bioregional directions ... information your readers could act upon, rather than simply being subjected to another morbid literary pose.

PETER BERG
Director, Planet Drum
Foundation
San Francisco (Shasta
Bioregion)

IN "GARBAGE ... ON LOCATION!" (March/April), I wish you'd named the northern cardinal instead of the starling as one of your five resident birds. The starling, in the U.S., is a man-made environmental disaster: In 1891 an avid Shakespeare fan released 60 pairs of starlings in Central Park — he wanted to see every bird mentioned in Shakespeare's works represented in the park. In 101 years, the starling has spread across the continent and can be found in every state, plus Canada and northern Mexico. Aggressive and opportunistic, they evict native birds from their nest holes and destroy their eggs or kill their babies. Affected species, including flickers, red-bellied woodpeckers, and eastern bluebirds can successfully breed only rarely. I have never even seen a bluebird in Central Park, and it's the State bird!

REBEKAH CRESHKOFF
New York City

PG&E's Friends in High Places

I COMMEND YOUR ARTICLE ON Pacific Gas & Electric

(March/April). PG&E's resolution to meet its customers' needs through energy efficiency and the use of clean technologies is an outstanding example of environmental entrepreneurship.

In recognition of this commitment, President Bush recently awarded PG&E the President's Environment and Conservation Medal for demonstrating that environmental values can be incorporated into sound management decisions.

As a result of PG&E's foresight and its partnership approach of working with diverse environmental, business, and consumer advocates, it is no wonder this California utility "wins praise from

friends and former foes alike."

MICHAEL R. DELAND
Chairman, Executive
Office of the President
Council on Environmental
Quality
Washington, D.C.

I Scream for Polystyrene

WE LIKED THE CANDID view of office recycling programs presented in your cover story "Recycling, Inc." (March/April). The Foodservice & Packaging Institute doesn't always see eye-to-eye with GARBAGE, but we appreciate your balanced approach and occasional light touch in covering solid-waste issues. However, several points in the story need to be clarified.

You refer to offices replacing "those dastardly Styrofoam cups" with coffee mugs, which is often viewed as an environmentally responsible action. Polystyrene cups are less "dastardly" than common environmental lore holds. This plastic is being recycled in many locations across the country. Offices involved in recycling should see if local facilities for polystyrene are available.

People seem to forget why we have disposable cups in the first place. One reason is to prevent the spread of communicable diseases from the use of public "common cups" for drinking, [a practice that was] prevalent earlier in this century. Recent studies have shown that improperly cleaned coffee

mugs (the result of inadequately heated water or low-quality detergents) often contain higher concentrations of bacteria than their disposable counterparts.

JOSEPH W. BOW
President, Foodservice &
Packaging Institute
Arlington, Virginia

Shredding CFCs

CHRIS CALWELL IS ALMOST right ("Letters," March/April). While utility-sponsored refrigerator recycling programs keep ozone-depleting CFC refrigerants out of the atmosphere, about one-half of the CFCs used as blowing agents in foam insulation may be released during the shredding process.

Northeast Utilities will become the first entity to incorporate CFC-11 recovery from foam insulation as an integral component of the appliance pick-up program. The equipment will be installed by the last quarter of this year. This technology, which has been demonstrated to recover 99 percent of the CFCs in foam insulation, will turn a cost-effective electricity conservation program into an environmentally optimal recycling effort.

BRUCE J. WALL
Northeast Utilities
Hartford, Conn.

Correction Regarding "Cooperative Marketing of Recyclables" (May/June '92): It is the King County Solid Waste Division, not the King County Commission for Marketing Recyclable Materials, that facilitates cooperative recycling for Tukwila, Washington, businesses.



One day, local governments are going to study more carefully what's really going into our landfills. And when they do, along with all those materials that are impossible to get rid of any other way, they'll find tons of garbage that everyone thought was recyclable.

If Everything That Came To The Landfill Were Aluminum, There Wouldn't Be A Landfill.

One thing they won't find more than a trace of, though, is aluminum.

The reason is money. There are two economic facts that make aluminum different from virtually every other kind of container material. First, 100% of every aluminum can is recyclable into another aluminum can. It's recycling in the purest form. We don't need to invent new by-product technologies to

use the materials we reclaim. With aluminum, a can becomes a can becomes a can.

Second, it takes 95% less energy to recover aluminum from a used can than it does to produce aluminum from ore. Since energy is money, our

than plastic and 18 times more than glass* to get a container back.

Once you know how much we pay, it's easy to understand why local governments and private recyclers go out of their way to see that aluminum gets to us and not into their landfills.

A large portion of what is going into landfills right now is "recyclable" material that the marketplace simply won't pay enough to recover. Many materials claim to be recyclable, aluminum gets recycled.

If you're convinced about the need to use recyclable resources, we urge you—and we'll pay you—to recycle every scrap of aluminum you've got.

economic interest—plain and simple—is to get back as many cans as possible.

What does all this have to do with your local landfill? Start with the fact that scrap aluminum is much more valuable to us than used steel is to the steel industry or used plastic is to the plastic industry. In fact, we pay 15 times more than steel, eight times more

And we also urge you to think about how much higher your revenues would be, how much emptier your landfill would be, and how much better off the environment would be, if more things came in aluminum cans.

Aluminum Pays.

To learn more, write

Community Recycling, The Aluminum Association, 900 19th Street, NW, Suite 300, Washington, D.C. 20006.



LIFTING

Cruisin' with Click & Clack

GARBAGE recently caught up with Click and Clack, the Tappet Brothers, a.k.a. Tom and Ray Magliozzi. They're the hosts of Car Talk, a National Public Radio call-in show. The interview was conducted by Ethan Seidman.

What can our readers do to make their cars less harmful to the environment?

Tom: Don't drive the damn car when you don't have to. Second thing is, don't sit at idle. People think that shutting off the engine and then starting it up again somehow costs them more. And it doesn't.

So if I stop with a friend to buy milk I should turn the car off while he's inside?

Both: Yeeesss.

Tom: And most people shouldn't even be taking the car to buy the lousy milk. They should be walking.

Ray: Another thing people do is they warm up their cars excessively.

Tom: Ohhh yeah, this is a killer.

Ray: Especially in the winter. We're such sissies that we don't want to get into a cold car. So what do you do? You go outside and you start the car —

Tom: And you go back in the house for two more cups of coffee.

Ray: You have breakfast, you read the newspaper, and you go back out and the car is all

nice and warm inside. I mean, what have we come to?

Tom: A bunch of wimps.

How about gas? Is high octane better?

Tom: Everybody thinks that putting a tank of high-octane gas in your car is doing your car a favor. The truth is if your car is designed to run on 87 octane, then that's what you should use. Because if you use higher octane, it doesn't get you anything else, but it does pollute more. So you really should always run your car on whatever your book says, and most cars run on 87 or 89 octane.

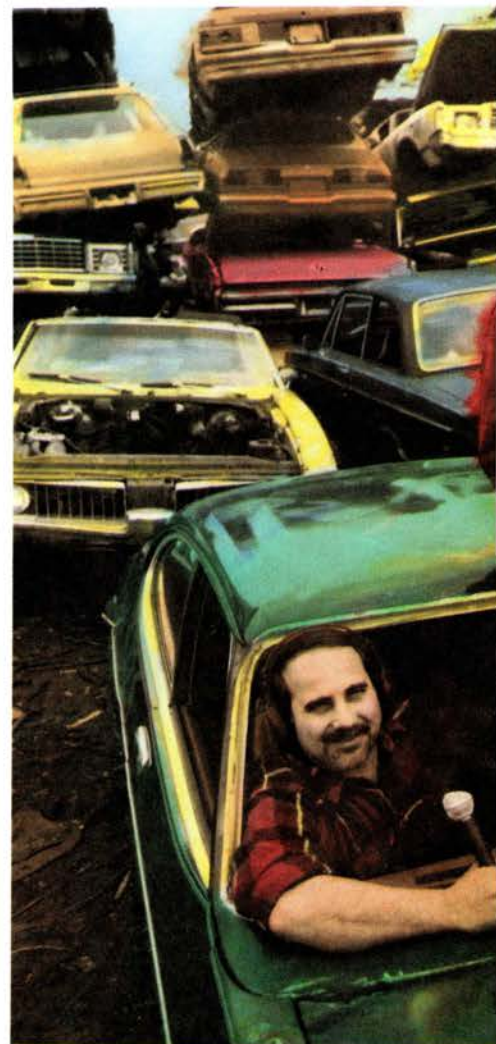
Ray: There are some higher-compression engines that do require premium, but they'll say so, usually on the dashboard. Some premiums have more detergents and if you're having a problem sometimes your mechanic will tell you to use the premium. But as a rule, use the cheap stuff. It saves you money and it pollutes less.

Where do you guys stand on the great oil-change debate?

Ray: Well, we have recently changed our stance. We had recommended for years...

Tom: Decades!

Ray: Fortnights! that you change your oil and filter every three thousand miles and we've since changed that to five thousand miles. The manufacturers recommend sev-

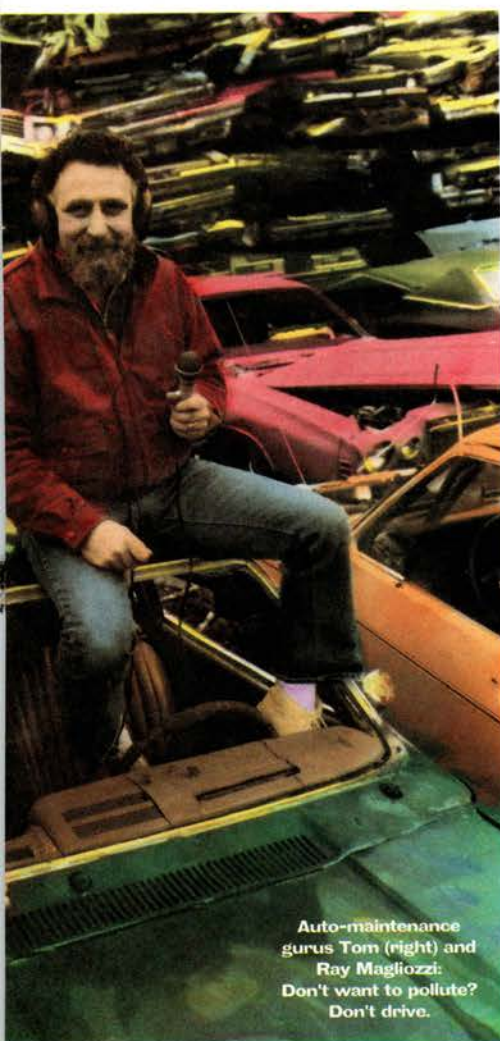


enty-five hundred, and in fact we may be leaning closer to that number than the three thousand, believe it or not. And the reason we changed is because —

Tom: We took the systems approach. Earlier our opinion was based only on the well-being of the car. And now the question is the car is only part of a whole system. And

THE ELLO

PEOPLE, NEWS & UPDATES



Auto-maintenance gurus Tom (right) and Ray Magliozzi: Don't want to pollute? Don't drive.

We do it at the shop and it adds a considerable expense.

You mentioned tradeoffs. Do you think environmental considerations and safety considerations are opposed?

Tom: When it comes to gas mileage I agree with those who say that if you try to get cars to go fifty miles to the gallon, that you are reducing safety. And there are others who say, 'Yeah, yeah, yeah, but you can make safe cars that are small and you can make big cars that get better gas mileage,' and all that is true. But manufacturers will take the easiest way out. So if we establish

a very high miles-per-gallon criterion, the easiest way for them to comply is to make a one-thousand-pound car. And a one-thousand-pound car is not safe. If you can legislate that it's got to be a safe car, that it can take a crash with a three-thousand-pound car and not get you demolished, and get fifty miles to the gallon, then yes, I think that they should do that.

Ray: And they *can* do that, except it costs money, which cuts into profits.

Do you have any enthusiasm for alternative fuels or reformulated-fuel plans?

Tom: I'm into electricity. I [Cont. on p. 16]

Got Glass? We'll Smash

GREEN PLAYGROUND SAND. BLUE GOLF-COURSE SAND. COLORED SAND COULD BE coming soon to a location near you. ■ Stuck with bunkers of mixed colored glass bottles and no glass making mills that want to recycle them, recycling officials are looking at a machine that can chomp bottles and spit out soft-edged, custom-sized sand for construction, sand blasting, and road paving, as well as more decorative uses. ■ "We're beyond bunkers," says Marilyn Skerbeck of Waste Management of Seattle, which is considering a sand machine to process its tons of smashed, colored waste glass, called cullet. "We're into mountains. The GlassBlaster is one more attempt to exhaust every avenue for marketing our cullet." ■ The GlassBlaster eats from 500 to 20,000 pounds of glass an hour, regardless of contaminants like caps and labels (or even stale beer). It produces a mixture of granule sizes from 1/8 inch to powder, and the resulting mixture can be screened to get the uniform grains that some customers need. ■ Though not cheap (\$9,500 to \$151,000), a GlassBlaster can eliminate \$35 to \$135 per ton in shipping or landfilling fees for colored-glass bottles that aren't recycled. And don't forget the revenue generated from your old Heineken bottles — but alas, even green sand fetches only a few greenbacks per ton. ■ If you want the snazziest sandbox in town, contact Vitreous Environmental Group, P.O. Box 1252, Delta, B.C., Canada, Z4M3T3; (604) 946-1919.

— Hannah Holmes



the rest of it is the person, and his money or her money, and the environment. And when you put all that together it made us go to five thousand.

Ray: Obviously it's a tradeoff: You don't want to hurt your pocketbook and you don't want to hurt the environment. The biggest problem is disposing of the filters.

Despite Corporate Homilies, Real Change

THE PHILLIPS PETROLEUM MUSSELS ADVERTISEMENTS (SEE P. 50) are the start of a new campaign by the oil company. It probably represents the future of environmental advertising — more focus on ornamental corporate practices (like salvaged wetlands), and less on the environmental merits of products on the shelf. The reason: too many companies have been burned by “green” claims that don’t hold up.

The case that most made advertisers gun-shy is more than two years old: Mobil’s ad campaign for biodegradable Hefty bags, which provoked false-advertising lawsuits by attorneys general of seven states, was killed in March 1990. While negotiating their way out of the suits, the company “pretty much admitted they had been knowingly misleading the public,” says Joel Makower, editor/publisher of *The Green Consumer Letter*. In the aftermath, of course, the Federal Trade Commission has kept busy examining such claims as “ozone-friendly.”

The reduction in green advertising doesn’t mean companies have been sluggish about redesigning their own products, however. Makower points out that Mobil followed up Hefty with Steel-sack trash bags, a significant improvement because they have 30 percent less plastic. “But there isn’t one word of this in the ads or on the label.”

Besides the fear of sticking their necks out and having them chopped off by regulations, companies wonder whether consumers even care that much. Greg Ray of the Evergreen Oil Company in Newark, California, one of the few wholesale refiners of used motor oil, says some major oil firms use increasing amounts of his product in their fuel and motor oils. But they, too, are silent. “I don’t think they think the customers are ready to trust used motor oil,” says Ray.

Certainly, it would be a shame if a worthwhile product were to die because it wasn’t marketed hard enough. On the other hand, there’s something comforting about knowing that mainstream products are coming around, offering quiet virtues we can discover on our own, without hype.

— Art Kleiner



“I’m not going to be planting any damn tree. Every time I turn around, someone’s asking me to plant a tree. I hate trees.”

— DOUG GOTT, whose family got a permit to build a big, blue gravel-storage building, wasn’t keen on the notion of obscuring it with trees.

(*Bar Harbor Times* [Maine], April 2, 1992)

How to Reduce Office Waste

A double-spaced, single-sided memo uses four times as much paper as one that’s single-spaced and copied on both sides. A new report from the environmental-research group **INFORM** shows how, by acting on that simple fact, businesses can save hefty amounts of paper — and money. Here are some of their tips for reducing waste at the office:

■ **ELIMINATE UNNECESSARY COPIES, NOTES, AND MEMOS:** Put office announcements in central locations. Share and circulate documents. Set up central filing systems. Reformat faxes to omit cover sheets. Edit on the computer before printing. Store files on computer disks. Use small pieces of paper for short memos.

■ **USE ALL PAPER ON TWO SIDES, WHEN POSSIBLE:** Increase two-sided copying. Print rough drafts and informal memos on the unused side of paper that would otherwise be thrown out (draft paper). Load laser-printer paper trays with draft paper. Reuse draft and computer paper for notes and scrap paper.

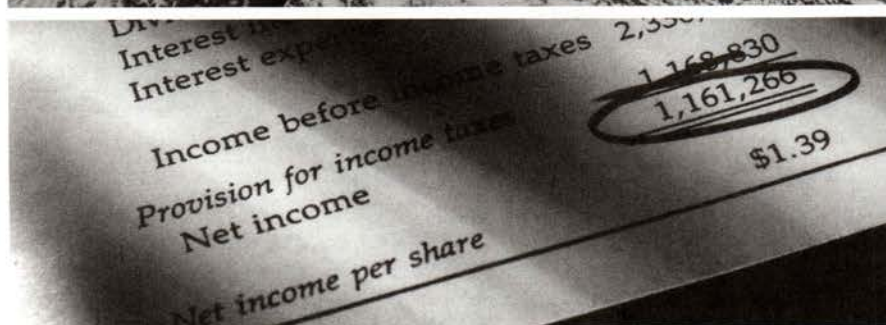
■ **FURTHER REDUCE PAPER CONSUMPTION:** Single space documents when possible. Set narrower margins for drafts. Change margins to avoid pages with minimal text. Use smaller type-face. Reuse file folders. Share the morning newspaper.

■ **ENCOURAGE YOUR OFFICE MANAGER TO BUY:** Laser printers that can make double-sided copies; a computer program that allows you to fax from a PC to avoid print-outs; fax machines that use plain paper; narrow-lined note pads; electronic-mail systems for memos; photocopying machines that are set for two-sided copying (existing machines can be adapted).

■ **SWITCH FROM DISPOSABLES TO REUSABLES:** Use reusable tableware (mugs, spoons, plates, etc.) and cloth towels in kitchens and bathrooms. Refill laser cartridges and re-ink typewriter ribbons. Buy reusable filters for coffee machines. Buy mechanical pencils, refillable pens, and refillable tape dispensers. Encourage co-workers to reuse lunch bags. Consider purchasing a water cooler to replace individual bottled water.

To order a copy of *Reducing Office Paper Waste*, contact **INFORM, Inc.**, 381 Park Avenue South, New York, NY 10016-8806; (212) 689-4040. \$18 ppd.

AN ENVIRONMENTAL REVOLUTION FROM TOP TO BOTTOM.



Something enlightening is taking place. A historic partnership between the federal government and America's business community to protect the environment by promoting the use of revolutionary lighting technologies that reduce pollution.

Green Lights, a voluntary corporate initiative, encourages the use of energy-efficient lighting where it is profitable and where lighting quality is improved. Through this initiative, over 200 major corporations have already agreed to reduce emissions of greenhouse gases and help curb acid rain and smog by voluntarily upgrading their lighting systems.

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What Color is Green?

PICTURE AN ENVIRONMENTALIST — WHOM DO YOU SEE? HE OR she is probably white. After all, the environmental movement in the U.S. has been largely a white, middle-class affair.

Citizens for Environmental Justice doesn't fit the stereotype. Based in Savannah, Georgia, it's the state's first all-black environmental group. CEJ was founded last February by English teacher and long-time activist Mildred McClain, who returned to her hometown after earning a doctorate in education from Harvard.

Dr. McClain found that environmental problems were having significant impacts on the African-American community, but that the predominantly white environmental groups were not reaching out to get them involved. "If

an environmental group had been organizing in our community there would have been a lot of receptiveness. The traditional white groups . . . weren't addressing us."

Dr. McClain has plenty to be concerned about. Savannah is highly industrialized, with about 30 plants pouring pollutants into the air, water, and ground. There are 42 hazardous waste sites slated for cleanup by the federal Superfund program in Savannah's Chatham County; altogether there are over 220 sites in the county that process or dispose of hazardous materials. Take a look around town and a pattern becomes painfully clear:

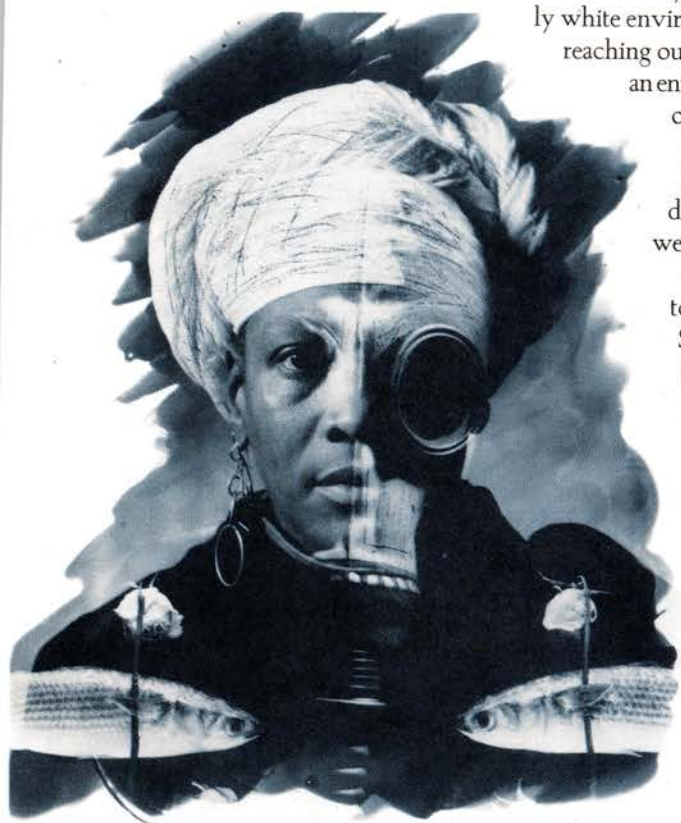
The neighborhoods nearest the smokestacks and waste sites tend to be poor, and the poor tend to be African-American.

With about 60 members, CEJ works on building awareness in the African-American community, which has traditionally focused on jobs, housing, and social-justice issues. "I bring it to them in their language, especially the young people. That's my mission," says Dr. McClain. "After they hear the facts, they come to the conclusion on their own that they ought to be interested."

To contact CEJ, write Dr. Mildred McClain, Citizens for Environmental Justice, P.O. Box 1841, Savannah, GA 31401.

— Ethan Seidman

English teacher
and activist
Mildred McClain
of Savannah,
Georgia



Energy Enigmas

U.S. energy consumption per household,
1978: **138 million Btu**

U.S. energy consumption per household,
1987: **101 million Btu**

Energy consumption per household in the
West, 1987: **78 million Btu**

Energy consumption per household in the
Northeast, 1987:

124 million Btu

Household energy consumption that went
to air conditioning, 1987: **5%**

Household energy costs
from air conditioning,
1987: **10%**

Estimated typical yearly
savings gained by un-
plugging the TV when
turned off: **\$4**

Portion of energy consumed by washing
machines to heat water for hot cycles:
90%

Energy saved by using a front-loading
washing machine instead of a top-loader:
50%

Energy saved by using a clothes dryer with
a moisture sensor: **15%**

Percentage of heat in homes lost through
windows: **10-25%**

For windows with aluminum frames, por-
tion of heat loss through frames: **24%**

For windows with wood frames, portion of
heat loss through frames: **13%**

Estimated worth of energy that escapes
annually as heated or cooled air through fis-
sures in residential buildings: **\$13 billion**

Estimated amount of air conditioning in a
typical large office building that goes to cool
heat from lighting: **30-50%**

SOURCES: Energy Information Administration,
Texas Energy Extension Service,
Rocky Mountain Institute

Garbage
Index



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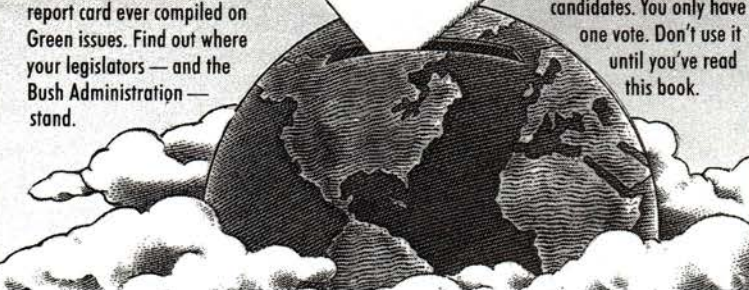
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Click & Clack

[Cont. from p. 11] really think that electric cars are the way to go.

Ray: And if you saw his hair you'd know he's into electricity.

Tom: The truth is we have the technology right now. For most people's motoring needs an electric car would work. I can't find one to buy, but the kind of driving I do, and which most people do — which is commuting less than fifty miles in one direction — they could do it with an electric car. And if there were enough of them made, the prices would be reasonable. L.A. is making moves in that direction, but I think they could even go faster.

What do you think of ethanol?

Ray: Well, the biggest problem with ethanol is the petroleum lobby. They have a lot of vested interest in keeping ethanol off the market.

Tom: Well, when I become Philosopher King there will be no more lobbies.

What else would you do?

Tom: I would not allow cars that were gas consumers into cities. So when you come to the boundaries of a city you've got to leave your car and hop into an electric thing. Maybe like a —

Ray: Maybe like a train. How's that for a novel idea?

Tom: Maybe like a train. Or, if you wanted personal transportation, it could be golf carts. And they could be sitting there and people could just use them.

Ray: The sad part is, all this stuff must come through legislation, because people don't do anything that represents any kind of an imposition on their freedom unless they are forced to do it.

Tom: Oh, it's all got to be force.

Ray: And nobody's going to say, 'Well, I'll take the train into work because that's the right thing to do.' The people that are conscientious will do it, but there are only a handful of them.

Tom: That's why it's got to be done by the Philosopher King, because democracy doesn't work, as we know.

Ray: Right, it's got to be imposed on everybody else. We should work for legislators that are willing to come up with the kind of legislation that will force people not to drive their cars.

"Remember that two definitions of 'green' in the dictionary are 'naive' and 'immature.'"

— From a four-page insert for consumers published in the trade magazine *Packaging*, April 1991

Getting Rid Of Batteries (Sept/Oct '91) Kodak and Panasonic have hit the shelf with (nearly) mercury-free alkaline batteries — the type of battery that puts the boom in a boom box, then puts toxics in the trash a few hours later. Other brands will follow suit this year and next.

Mercury is a heavy metal, which enters the air when batteries are torched in incinerators. Mercury can also leach into groundwater when batteries are buried in leaking landfills. Devastating to the central nervous system and the kidneys, mercury accumulates up the food chain and has especially posed dangers to fish eaters. While mercury-free batteries are certainly an improvement, disposable alkaline batteries still contain zinc, which can be dangerous to aquatic ecosystems and are wasteful when compared to rechargeable batteries. Even a mercury-free battery is garbage when it dies; rechargeables, on the other hand, just keep going, and going, and....

Visionaries: The Future of Garbage (Sept/Oct '91) After two years of wrangling with Maine's Department of Environmental Protection for approval to test and license his "tralchemy" incinerator, inventor Charlie MacArthur is fed up. Months after requesting

permission to test an updated version of his low-emission garbage burner, MacArthur hasn't heard from the DEP. Meanwhile, the manager of a Philippines engineering firm saw our article and invited Charlie from his home in Sangerville to Manila, where he signed a contract to manufacture and distribute his incinerators. Countries in Europe and Africa have expressed interest as well. The small-scale units are designed for small town, decentralized solid-waste systems and use an innovative burning method, making them attractive to countries that are more willing to try alternative environmental technologies.

"While making progress abroad, in our home state bureaucratic rigidity has slowed, stalled, and hampered us at every turn," Charlie wrote in a recent letter to *GARBAGE*. "If the State does not want it, the State need not have it." He included a half-page definition of the word *Bureaucrosis*: "An epidemic disease, the virus attacking the seat of government where the brains are erroneously thought to be located...."

Eating Low On the Food Chain (Jan/Feb '92) As part of an "Environmental Cop" program at the Dade County, Fla., public school system, students have designed meatless menus that their school or a commercial restaurant might serve. The schools, which dish out one million meals

a week, also planned a day when meat-free dishes would be served district-wide. The federally-approved options include french toast, vegetarian rigatoni, cottage cheese with fruit, and vegetarian chili on a baked potato. Nutritional guidelines permitting, these may be augmented with recipes from the students — one menu featured Cajun jambalaya rice, Creole zucchini, and sweet-potato biscuits.

"The kids really want to do the right thing," says Edmund Benson, who sits on the county's public-school nutrition task-force.

Could be. Or maybe it was all those Mystery Meat specials.



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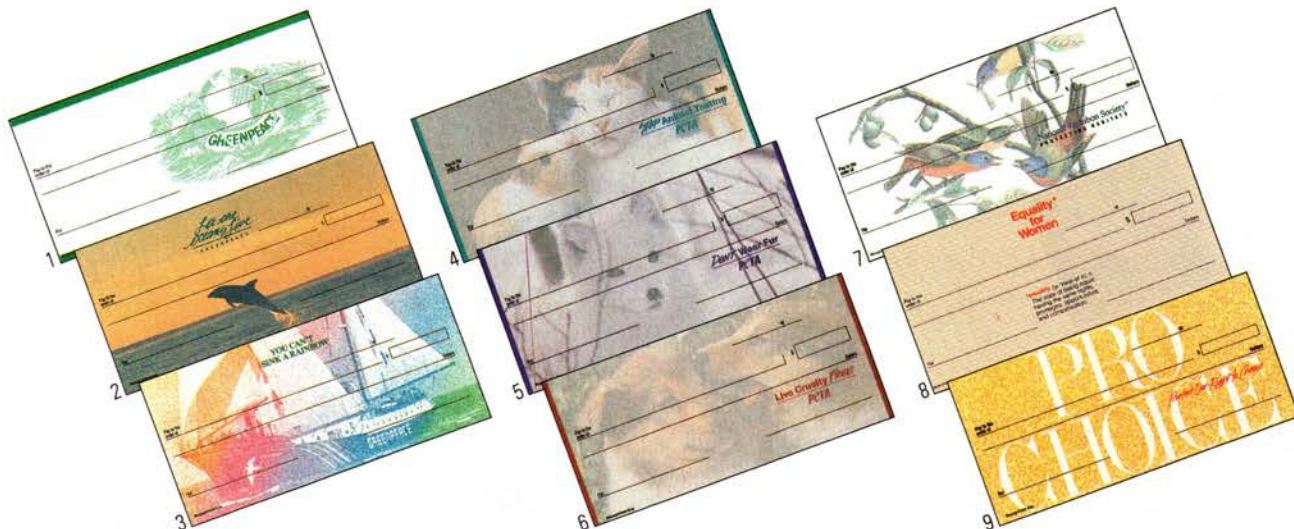
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Sleuthing Ancient Forests

ROBERT T. LEVERETT HAS NEVER LIKED A TRAIL THAT HE'S hiked. ¶ I realize this as we bushwack across the rugged ridges of the Cold River watershed in the Berkshire hills of Massachusetts. An icy rain spits from clouds scraping the treetops, but there's no talk of turning back. We're heading for a place where trails end: one of the last stands of virgin,

"old growth" forest left in Massachusetts.

In this largely suburbanized state, you might think no old forest could have escaped the chain saws. Most of the experts thought so. But six years ago Bob Leverett, a transplanted native of Tennessee who explored ancient forests in the southern Appalachians, discovered a stand of virgin forest in a northern corner of Berkshire County. Working with the Massachusetts chapter of the National Audubon Society, he's gone on to sleuth about 20 patches of prime old growth collectively totaling from 500 to 800 acres.

More scrambling, and we reach a swath of red spruce and northern hardwoods, 300 yards wide, winding for two miles along boulder-strewn slopes. Rising out of thickets of mountain laurel and Canada yew are the steel gray trunks of beech and sugar maple, and the darker cloaks of red maple and eastern hemlock. In some spots, the canopy tops 100 feet. "Old growth," Bob pronounces.

Though they take on the "dark and arrowy" shapes described by Thoreau, these ragged New England woods hardly resemble the cathedral forests of the Pacific Northwest. To identify eastern old growth, you look for subtleties. Bob points out the "pro-

file" of tattered trees that have lost their branches through scores of winters. He looks for the "pit and mound" of a forest floor littered with rotting tree limbs and a rich layer of mosses. He counts the rings on downed trees — some endured for more than 400 years. And he seeks places with no sign of human intrusion, such as cut stumps or the faint path of an old logging road.

Why value this relict forest? It's a surviving fragment of New England's natural history. Because it predates industry, old growth can

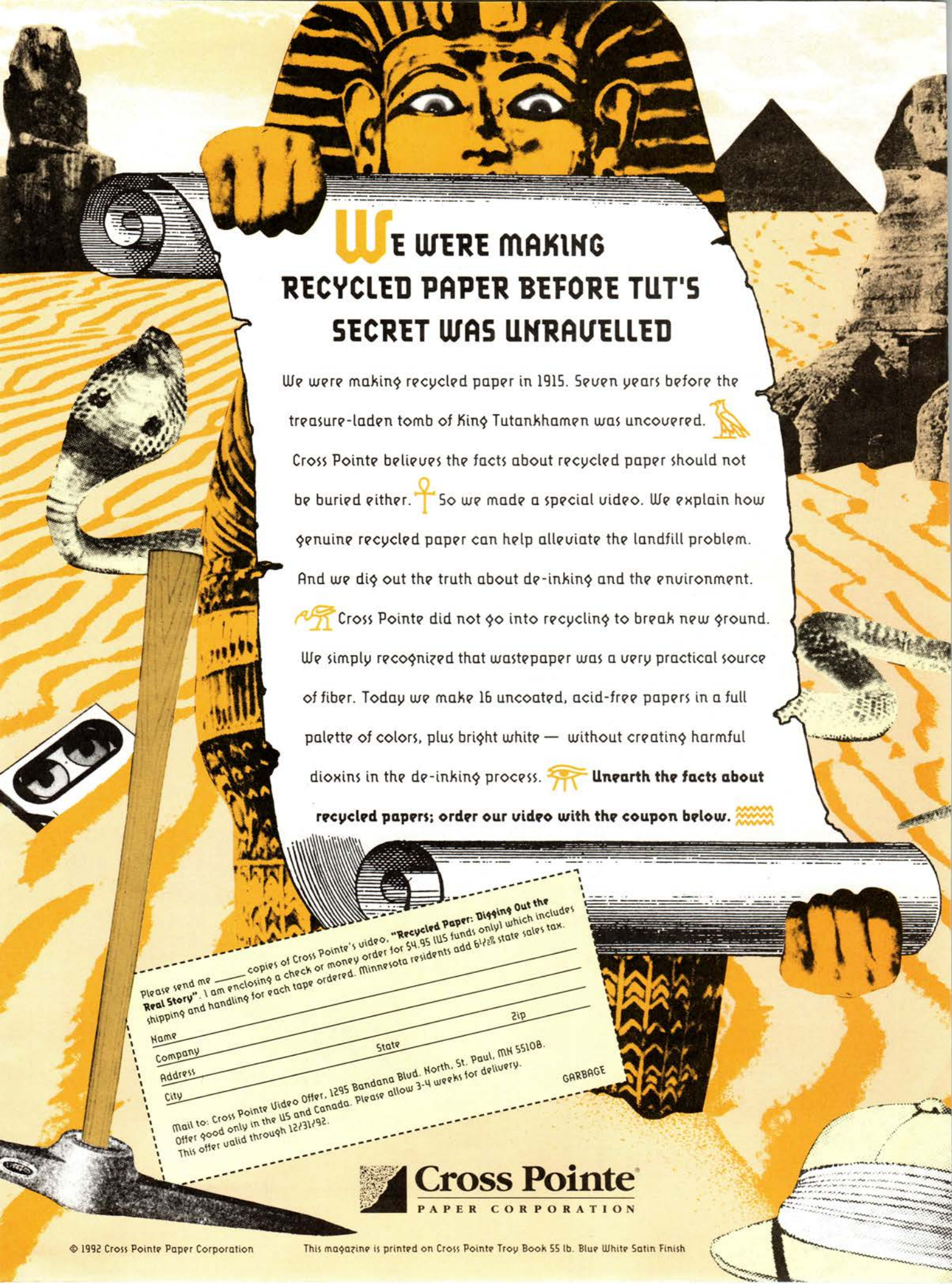
be used as a yardstick to gauge the effects of acid rain and long-term atmospheric changes. It may help biologists understand how microbial action occurs beneath the humus layer. "It shows what nature does over a greater period of time," says Bob. "Besides, these places have a spirituality about them, a certain magic."

To learn more about eastern old growth forests, contact Mr. Robert Leverett at 52 Fairfield Ave., Holyoke, Mass. 01040; (413) 538-8631.



In Massachusetts, Robert Leverett (above) and other volunteer naturalists are identifying for preservation surviving fragments of ancient forests (right).





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Name It and Claim It

THE QUESTION I'M ASKED MOST OFTEN: "WHAT'S THE BIGGEST surprise you've found in your landfill digs?" Garbage students in the know assume that I will answer "styrofoam" (actually, expanded polystyrene), because its volume is so small compared to most people's perceptions.¹ Others are sure I will say "paper," because of its prevalence.²

You're all wrong. The biggest surprise was landfill content that fooled us even after dig results began to accumulate — construction and demolition (c/d) debris.

At first, we had avoided or ignored c/d debris as best we could. There were several reasons for our aversion: (1) c/d debris is extraordinarily dull and uninteresting (lumber, concrete, rebar, and wall-board). (2) c/d debris is bulky, heavy, and unmanageable. Just one ruptured block of concrete can be the size of a standard Garbage Project sample of landfilled refuse. (3) c/d debris can disable the toughest landfill excavation equipment.

As a result of our disaffection, very little c/d debris was recorded in the first six landfills we dug . . . never mind that we had to drive around huge mounds of it on the surface, and that every so often we would abandon an excavation when our bucket auger hit an impenetrable layer of concrete.

Let me say that we were not the only ones whom c/d debris eluded. The EPA has labeled c/d debris as an independent category of waste, distinct from ordinary MSW (garbage). To wit, according to official EPA calculations by Franklin Associates, c/d debris takes up no room whatsoever (!) in municipal landfills.

In reality, of course (if unofficially), landfills are chock-full of c/d debris. When the Garbage Project purged itself of its own bias and took refuse samples every five or ten feet, no matter what, our picture of the insides of landfills altered dramatically. Excavations at our last three U.S. landfills documented that c/d debris alone was equal to 28 percent of the weight and 28 percent of the volume of general mixed refuse. Rather incredibly, recent digs at four Toronto-area landfills produced absolutely identical results.

These monumental quantities of c/d debris (and our earlier blindness to them) reminded me of a National League

of Cities conference I spoke to in Minneapolis in July of 1990. In characterizing the contents of municipal landfills, I was the only one of several speakers to focus on c/d debris. Yet, according to our data, *c/d debris was much more significant to landfill management policy than all of the then-current targets for legislation: styrofoam, fast-food packaging, disposable diapers, as well as the totality of plastic packaging — even if you added them all together.* The audience was understandably confused. How could my figures be correct if no one else so much as mentioned c/d debris? Their skepticism, however, was short-lived. The conference agenda included a visit to a landfill. By the visitors' own counts, about one-third of the trucks they witnessed left wave after wave of c/d garbage piled in their wake.

There's nothing new about construction-and-demolition debris. Among the early civilizations of the Near East, for example, when a house of baked clay brick, timber, and mud-thatch was rebuilt,



1. Landfill contents of styrofoam dumped 1986-1990, by volume — public perception (polled): 20 to 40 percent; reality: only 0.8 percent.

2. Landfill content of paper dumped 1986-1990 by volume: 40 percent. Also, most landfills are kept dry to avoid hazardous leachate, hence paper does not rapidly degrade.

the old roof and walls were knocked in to use as a foundation for the new structure. In this manner, ancient cities rose atop their c/d wastes. Cities still do. Much of London is fully 20 feet higher than its earliest ancestor of Roman times. Construction fill underlies LaGuardia airport, much of Foster City, California, and Toronto's tony harborfront district.

No one knows for sure how much c/d debris has been incorporated into New York's substrata, but there are clear signs of it anytime a hole is dug. Recently, construction workers unearthed a ship, complete with a few loads of garbage, that had been positioned as fill on a Manhattan beach in the late 1700s. The ship lay twelve feet below 175 Water Street in the Wall Street district.

Because of the systematic scavenging (authorized and unauthorized) that goes on at any demolition site, much of what *might* be filling up landfills, isn't. Take, for example, Ebbets Field in Brooklyn, which in 1960, after the Dodgers left for Los Angeles, fell prey to a wrecker's ball (did you know it was painted to look like a baseball?). As always, an army of professional salvagers was on hand to strip away pipes, tubes, wiring, and fixtures. (But first, Dodgers president Walter O'Mally somehow succeeded in carrying away the park's public address system and 7,000 choice box seats.)

Then, at an auction, the bases, dugout, telephones and benches, lockers, stadium seats, flagpoles, railings (subdivided and resold as bookends and paperweights), and even flower pots of "genuine" Ebbets Field sod were diverted from burial. Finally, public projects and charities vied for those obviously useful items not quickly sold. The biggest winners were the inmates of the New York City Workhouse on nearby Hart Island, making off with 2,200 seats and field lights to spruce up their own baseball diamond.

This tale of hardcore scavenging is not unusual — fortunately. The parts of Ebbets Field no one wanted still took several weeks to cart off to landfills.

Today, disposal authorities (especially in Greater Toronto) have joined with contractors to target c/d debris for recycling and reuse. Big job, but I'll be surprised if the payoff in reducing landfilled wastes isn't even bigger.

ECO·INK

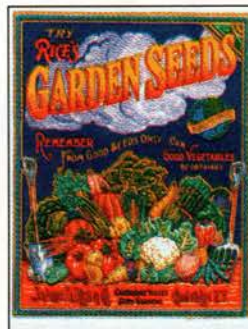
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Why We Need A

In the lists of simple things one can do to save the Earth, under air conditioning the advice is usually this: "Don't use it." Many environmentalists proclaim air conditioning is a frivolous waste of energy and a source of ozone-wrecking CFCs. Oh yeah? Methinks they live north of the Mason-Dixon line, and should acquire some empathy by going through a winter without heat. ■ Nonetheless, it's true cool has come with a high ecological price tag, including an expanding ozone hole overhead. Being 15,000 times more efficient than CO₂ at trapping heat, CFCs also contribute to global warming, causing one-quarter of the greenhouse effect. The outlook for future solutions is mixed. Many CFC substitutes also eat ozone or are toxic, and CFC-free cooling will be slow to come on line. Fortunately, there are a few things you can do to keep your cool environmentally. ■ I am a child of air conditioning, born in the sweltering bayou city of Houston at the tail end of July in 1956. Hospital and home were cool in air-conditioned comfort, despite it being one of the hottest weeks of the year. My relatives never let me forget my

BY AMY MARTIN ■ PHOTOGRAPHY BY THE DOUGLAS BROTHERS

ir Conditioning



good grace. When we visited grandma at her house in rolling farm country of central Texas, they would regale me with tales of the days B.A.C. (before air-conditioning):

"People were always getting sick from spoiled food. Sometimes they'd die. The kitchen'd get so hot it'd just about kill your grandmother and the refrigerator'd stop working. Blocks of ice didn't come cheap those days."

Or, "I felt so sorry for summer babies like your dad, red rashes from head to toe from sweating. And milk went bad so quick. The colic was incredible. Mosquitos would get through holes in the screens and bite 'em all night."

And, "Lord help you if you got sick with fever in the summer. You'd never cool down. I think we might not have lost your grandfather in the [1917-18] flu epidemic if we'd had a little AC."

How AC Shaped the South

YOU CAN SEE WHY THE PROSPECT OF LIFE WITHOUT AIR-CONDITIONING might incite the Second Civil War. To states below the Mason-Dixon line, AC is more than something to help you sweat less. It's not negotiable to the computer operator who has watched his million-dollar machine go haywire from heat. See how long hospital patients would fare without it. Or try cooling sans AC the downtown office tower whose heat-absorbing glass windows don't open.

It was at a southern cotton mill in 1906 that an engineer, Stuart Cramer, coined the term "air-conditioning" to describe how proper humidity "conditioned" the cotton fabric. Within two decades, air-conditioning swept the South, in textile, paper, and rayon mills, tobacco-processing plants, and hospitals. In the '40s, AC was being used by food industries nationwide to keep produce fresh for shipping. It enabled bread and milk products to be mass-produced and stored (sending a blow to corner bakeries and local dairy farms), and improved beer by controlling fermentation and pasteurization. Non-leavened crackers and distilled "moonshine" liquor had been part of Southern heritage because yeast-based items like beer and bread couldn't tolerate the heat.

In the early 1950s, window AC units for homes came on the market, followed soon by centralized systems. By the mid-sixties, the exodus was reversed. Yankees invaded the South once more. The Sunbelt — or more accurately, the AC Belt — was born.

The *New York Times* dubbed the 1970 head-count as "The Air Conditioned Census," prompting editorial writers to comment that "the humble air conditioner has been a powerful influence in circulating people as well as air in this country."

What actually circulated the Yankees south was industry expansion and relocations to the new AC Belt, land of cheap, non-unionized labor. Manufacturing operations of all kinds had been sparse in the South because industrial boilers and machines added heat to the already stifling climate. But, as the saying goes, it wasn't just the heat, it was the humidity. Too much humidity is more than uncomfortable. Inks won't dry on paper; dyes can't set on fabric; iron rusts. Mass production is virtually impossible if you have to stop to dry equipment.

The guy considered the father of AC, Willis Carrier, was

a native of Buffalo, New York — hardly a hot spot, but it did have a summer humidity problem. Before Mr. Carrier, folks wanting to cool the air had either circulated it without removing the heat; or they cooled the air, but didn't dry it.

Mr. Carrier's conceptual breakthrough combined with rapidly developing refrigeration technology to create the modern air conditioner by the 1930s. After World War II, air conditioning took off. Schools and libraries, office buildings and retail stores, followed on the AC bandwagon. On sweltering summer nights, flashing neon signs at restaurants, nightclubs and movie theaters enticed: refrigerated air inside. To Southerners, it seemed like heaven.

Then came the 1950s, which engulfed us in not only home air conditioners, but also freezers, televisions, electronics, and appliances, all adding heat to the AC load. Centralized systems for AC supplanted the window unit; by 1965, one in 10 single-family homes had total cool. The computer revolution took hold in the 1970s, ushering in a new generation of things to keep cool, as well as dust-free. Flush with oil money, the South embarked on a consumer cooling spree in which tractors, trucks and cars, dog houses, grain silos, sports domes, even the Alamo were outfitted with AC. By the '80s, central air was being built into 75 percent of new homes nationwide, and even more businesses.

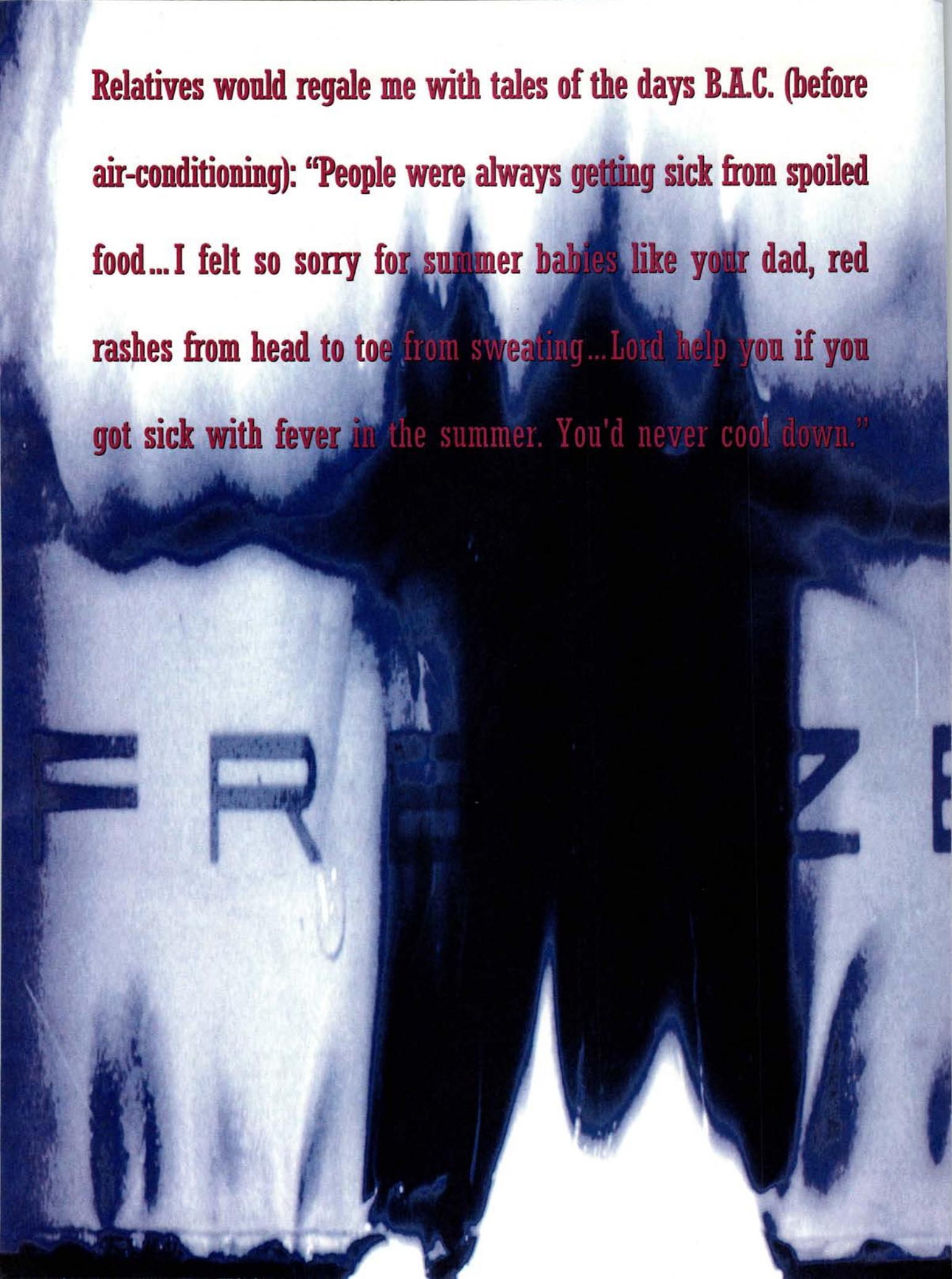
Now there's no turning back. With the dominance of centralized AC, architects stopped designing buildings to take advantage of natural breezes and other passive cooling methods. (See *Keeping Your Cool*, p. 26.) Life without AC is now much less feasible, even northward. Even if natural cooling could eliminate our sweat, it couldn't maintain the consistent temperatures and low dust levels required to make and operate computers and other delicate electronics.

How AC Works

TO UNDERSTAND MODERN AC, IT HELPS TO KNOW SOME SCIENCE basics, such as the following laws of physics and thermodynamics.

- Heat is energy. Example: Expend some energy. You get hot.
- Energy cannot be created or destroyed, only transformed from one state to another. Examples: The caloric energy of food becomes energy to run your body; the mechanical energy of steam, captured by turbines, becomes electrical energy.
- Heat energy will always flow from where it's hot to where it's not. Example: When you're hot, slap a cold towel on your forehead. The heat of your skin (from the caloric energy you ate) is drawn to the cool towel, which gets warm.
- Compressing a liquid lowers its boiling point, so it evaporates more readily. Example: Water boils more slowly at high elevations because there is less air pressure exerted on the water.
- When a liquid heats, its atoms are agitated, eventually spacing as far apart as possible. The result is a chill where the liquid used to be, because heat was carried away. Example: Rubbing alcohol evaporating off your skin imparts a sensation of coolness.
- The colder air is, the less humidity it can hold, hence chapped lips in the winter. Conversely, the hotter air is, the more moist it can be, and the hotter our body perceives it to be because sweat can't evaporate.

Relatives would regale me with tales of the days B.A.C. (before air-conditioning): "People were always getting sick from spoiled food...I felt so sorry for summer babies like your dad, red rashes from head to toe from sweating...Lord help you if you got sick with fever in the summer. You'd never cool down."



Keeping Your Cool

With or without AC, everything you do to make your abode energy efficient will lighten the heat load. So tighten up. Long-term goals should include thick insulation, insulated windows, a radiant barrier under the roof to reflect the sun's heat, and venting of humidity sources: bathroom, stove, dryer. But short-term projects abound, and will make a difference you can feel.

Block That Beam

- Apply tinted films to unshaded windows on the west side of the house.
- Overhangs and awnings reduce heat gain on southern windows by 65 percent and 77 percent on eastern ones. They let in lower winter sun but block it in summer.
- Exterior window blinds and shutters work for intense situations when maximum light blockage is needed but ventilation is not. Solar screens are like regular exterior screens except they have miniature louvers to reflect back sunlight while letting some breezes and view through. Inside, adjust light and heat with shutters, blinds, roller shades, and curtains.
- Use glass storm doors all year, preferably one with a pane/screen option. Small, enclosed entry rooms save energy and keep in coolness, especially if the door faces a prevailing wind.

Beat Back the Heat

- Reduce inside sources of heat in summer. Do your cooking at night, and use the vent or, ideally, the microwave. Avoid hot and humid activities like boiling pasta. Laundry and ironing should also be done at night. Check that your water heater and pipes wear insulation jackets, and that your dryer is vented outdoors. Reduce heat from lighting by using fluorescent bulbs, and unplug appliances when not needed — even turned off, they

can generate heat.

- The west side of the house, where merciless afternoon sun falls, is a good place to construct an arbor or patio covered with deciduous vines. They'll buffer the sunlight in summer, but let it through in winter when the leaves drop.
- Shade the roof with light-colored shingles, or deciduous trees or vines. Solar-energy and solar-heating panels can put roof heat to good use. Climates with hot days and cool, clear nights can use shallow roof ponds, which absorb heat from the house during the day and radiate it back out at night.

Whip Up the Wind

- Figure out from which direction prevailing winds arrive each season. Use that wind to move air through the house.
- Walls, especially those on the west side, absorb the afternoon heat and radiate it inward in the evening. When you feel the heat surge, use fans to draw the heat from the walls and out of the house.
- Jalousie windows have louvered glass slats that open outward with screens on the inside. Adjust their angle to reflect sunlight while letting breezes through. Usually too to seal, they, like casement windows, aren't recommended for cold climates.
- Double-hung windows, which open halfway from the top or bottom, are ideal for box fans, some of which can ventilate an entire house. Use box fans to draw in air from the lower windows on the cool sides of the house.
- Ceiling fans circulate air per room, making AC work much more effectively. Attic fans suck hot air out of your lower stories; roof turbines draw hot attic air outdoors. Be sure to cover them in winter. Convection fans that move air slowly, steadily, and quietly are good for offices.



Put it all together to make the modern air conditioner. In most cases, the cooling mechanism is a set of coils filled with compressed chemical coolant. Hot air passing the evaporator turns the coolant inside to gas, drawing away heat. This creates cool air, which is blown into the room. In humid climates, as the interior temperature drops, condensation forms inside the air conditioner and is drained away. The evaporating coolant is routed to another set of coils, usually called a condenser, which allow the trapped heat to flow away from the coolant, giving off the warmth you can feel behind a refrigerator or window air conditioner.

One minor detail remained: what to use as a coolant. In search of ice-free refrigeration for food, tests had been done since the early 1800s with a variety of substances, including ethyl ether, carbon dioxide, ammonia, and sulfur dioxide. All went from a liquid to gaseous state easily enough, but had serious drawbacks. Ammonia could kill you if it leaked. Sulfur dioxide wasn't very effective, and it smelled bad. Most needed to be compressed to work.

CFC Coolants: Too Good to be True

IN THE MID-1930S CAME FABULOUS FREON, THE ORIGINAL REFRIGERANT based on CFCs, chlorofluorocarbons. Freon seemed perfect. The fluorine atoms made the compound remarkably stable and inert, unlike other coolants which degraded with time. Freon was non-corrosive, non-flammable and relatively non-toxic, even though it contained chlorine, an extremely reactive chemical. And it didn't stink.

For nearly half a century CFCs (and their chemical cousin, HCFCs, a staple in home AC) cooled the world with a clear name. But atmospheric changes in the mid-1970s were the beginning of the end. It was discovered that CFCs, being lighter than air, inexorably rise through the atmosphere until hitting the roof of the world, the stratosphere. There a layer of ozone, O₃, a molecule of three oxygen atoms instead of the usual two, absorbs most of the sun's ultraviolet (UV) radiation.

Stratospheric ozone spares humans and animals below from rampant skin cancer, cataracts, and weakened immune systems,

to name but a few UV-induced health disorders. It also protects the delicate, one-celled phytoplankton which serve as the base of the oceanic food chain, and allows just the right amount of UV to reach land plants, too. Furthermore, the heat generated by ozone while repelling UV is a major force behind the planet's weather.

A feeding frenzy takes place when the reactive chlorine atoms of disintegrating CFCs collide with ozone, which is also unstable. A chlorine atom in the CFC wrenches away an oxygen atom from the ozone molecule. Created in its place is a useless compound of one chlorine and one oxygen atom, called chlorine monoxide, ClO. Remaining is a two-atom molecule of oxygen, which lacks ozone's protective properties.

In a flash, the oxygen atom of the ClO starts searching for something to react with and bonds to the nearest lone oxygen atom it can find, which in this stewing molecular fun-fest isn't hard. The new oxygen-to-oxygen bond frees the chlorine atom to find a new mate. Thus one chlorine atom can destroy about 100,000 ozone molecules. That's scary. It's also a lot faster than natural forces can replenish ozone.

Spurred by the recent discovery of a second "ozone hole" over the powerful heads of Northern Europeans and North Americans, it appears U.S. production of CFCs could be history by the mid-90s. On July 1 of this year, the 1990 Clean Air Act will require that all CFCs vented during servicing or disposal of appliances and cars be captured.

CFCs aside, another problem awaits: HCFCs, the coolant gas in many home AC units. Promoted as a general replacement for CFCs, HCFCs (hydrochlorofluorocarbons) have one-twentieth of the chlorine and more hydrogen, so they break down easier in the atmosphere's lower levels. But organizations including the Environmental Defense Fund and the Institute for Energy and Environmental Research oppose HCFCs, on the grounds that plenty of the chlorine still reaches the stratosphere.

Twenty million tons of CFCs with an infinite number of chlorine atoms have already been released into the air; that total doesn't include HCFCs. Those released today won't reach the stratosphere for 10 to 15 years, and because pollution aids their staying power, there's no telling when they will leave. But even if not another molecule of CFC and HCFC were released, it would still take another 100 years or so for the ozone layer to return to its previously stable state.

Cool of the Future

AS SUBSTITUTE COOLANTS, THE OLD STAND-BYS OF SULFUR DIOXIDE and ammonia are still with us, along with their problems: They're toxic to humans and corrosive to metal pipes and plastic seals.

The crux of the challenge is finding a replacement coolant that works in existing equipment without major retooling, or causing a decrease in efficiency or an increase in energy use. The major contenders to CFCs include HCFCs, hydrochlorofluorocarbons; HFCs, hydrofluorocarbons; and plain old hydrocarbons, HCs.

■ HCFCs are far more common in home AC than CFCs. But appliances such as freezers and vehicle AC may use more energy with HCFCs.

The Care & Feeding of an Air Conditioner

Tips to keep in mind when you set out to buy an air conditioner: In general, the less an air conditioner is moved, the more secure its ozone-munching coolants are. Thus, centralized systems are "cleaner" than window units, which in turn are cleaner than vehicle units.

CENTRAL SYSTEMS

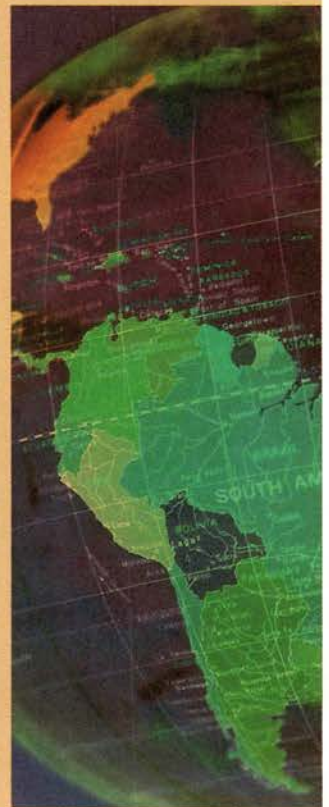
- If you have several rooms that need cooling several months a year, go central. This will be much cheaper if there is ductwork already in the house. Check that your wiring is up to the load.
- Central systems can come as split systems, with evaporators and blowers in each room or near a group of rooms. This is good for large houses, room additions, and houses without ductwork. It's more expensive initially, but more energy efficient.
- Heat pumps are air conditioners that reverse in the winter to keep heat inside. They're more effective in places with mild winters, and are difficult to retrofit (add on).

WINDOW SYSTEMS

- Install the unit on the east or north side of the house, weather-strip around it, and shade its top.
- Be sure both the condenser and evaporative units are level.
- Removable units should be stored in the winter.

BOTH SYSTEMS

- **SIZING:** The general ratio is 20 Btu per square foot of living space, which can be lowered with passive cooling and energy efficiency. It's better to under-size than over-size. A near-continuous flow of cold air is more efficient than cycling on and off.
- **EFFICIENCY RATINGS:** Room units are assigned an Energy Efficiency Ratio (EER), and central systems get a Seasonal Energy Efficiency Ratio (SEER). The higher the number, the more efficient the unit.
- **MAINTENANCE:** Change or wash filters monthly to control pollutants. Clean condenser coils regularly, especially during tree-pollen seasons. Keep drain channels free, and vents and registers unobstructed. Each spring have your unit checked for leaks, equipment calibration, and dust buildup.
- **EFFICIENCY MEASURES:** Close off rooms you seldom use. Install programmable on/off timers on both central and window units. Locate the thermostat away from doors, windows, and hot appliances, and set it to 78°. Keep in mind it's hard for any system to cool 20° lower than the outside temperature.



- HFCs have a better reputation since they lack chlorine. But they're flammable and don't work in most home AC.
- HCs such as natural gas can increase ground-level pollution. Also flammable, HCs don't work well in air conditioners or refrigerators.

Other potential chlorine-free coolants include cyclopropane, perfluorocyclobutane, and versions of 134 (an ether). Carbon dioxide (CO₂) is suitable for some uses, but machines must be built super-sturdy to take the required pressure of 2,000 pounds per square inch. (For information on a federal data base of refrigerants, tagged REFPROP, contact the National Institute of Standards and Technology at (301) 975-2208; or fax (301) 926-0416.)

Some researchers are pushing the envelope a little further, seeking ways to throw out the bulky, inefficient compressors along with the CFCs. Check your home-appliance store next century for AC's based on technologies like these: Sound waves sent from one end of a coolant-filled, soundproof tube can powerfully compress a wide number of benign gases and liquids. This method would use a simple but powerful stereo speaker, playing a note so loud it would hurt your skin if it escaped its tube. Or try thermocoupling: An electrical charge bouncing between two slabs of superconductor material draws heat from the slab on the cool side, and transfers it to the hot-side slab to be dispersed. No moving parts — now that's cool!

But what to do about those HCFCs and CFCs swirling away in your AC system at home and in the car right now? The answer: Keep them in good shape and under tight rein. Using your AC won't release them into the air, as long as there are no leaks. Have your AC's mechanical innards tuned up by a technician every spring, and be sure it's checked carefully for holes. Holes can both ooze out coolants and allow dust in. If the coolant gets too dirty, efficiency drops and the coolant must be captured and cleaned. Automobile ACs are the most likely candidate for a CFC leak. (See Cool Cars, right.)

The longer your AC lasts, the longer its HCFCs stay safely secured. Shading the outdoor condenser for your central AC, and using ceiling fans and other passive cooling techniques, can go a long way toward reducing stress on the whole system. Even a dehumidifier can reduce the need for AC. (See Keeping Your Cool, p. 26.)

So it seems the evil air-conditioning will be with us for the foreseeable future. When we need to be productive, or escape summer smog and ozone-hole alerts; when we need to catch a few hours of sweatless sleep, it's AC that enables us to do it. It is an ironic victory over Nature: Until we cut loose the chlorinated coolants, the dropping of the mercury indoors will continue to raise the mercury outdoors. ☞

Resources

Free unless noted.

- Air Conditioning and Refrigeration Institute, 1501 Wilson Ave., Arlington, VA 22209; (703) 524-8800. Directory of central air-conditioners, plus buying and maintenance guides.
- Association of Home Appliance Manufacturers, 20 N. Wacker Dr., Chicago, IL 60606. "Consumer Selection Guide for Room Air Conditioners," lists models with their EERs, and includes

a cooling-load estimate worksheet.

- National Center for Appropriate Technology — Publications, P.O. Box 3838, Butte, MT 59702. "Conservation for Window Air Conditioners," (1978) lists energy-saving tips. "Natural Cooling for Homes," (1979), is a 10-page how-to brochure.
- National Technical Information Service, Port Royal Rd., Springfield, VA 22161; (800) 336-4700. Ask about their numerous publications.
- Rocky Mountain Institute, 1739 Snowmass Creek Rd., Snowmass, CO 81654; (303) 927-3128. *Practical Home Energy Savings*, \$8 ppd. A whole-house book.

Cool Cars

Imagine yourself in a box of steel and glass, with just a few unscreened holes for ventilation, trapped on a humid, windless day under the blistering sun on a heat-absorbing ribbon of concrete and tar. Other steel and glass boxes all around are belching noxious fumes. Compounded by traffic tempers, the heat brings violent tendencies boiling to the surface.

The solution — rolling AC — presents its own problems. Compared to mere ounces of HCFCs in a home AC, car units use pounds of CFCs. The reason is twofold: The miniature compressor dictates that more coolant be used; and mobile AC gets jostled, and leaks. According to Joel Makower's *The Green Consumer*, 90 million air-conditioned cars and light trucks use 25 percent of CFCs, and cause over 16 percent of ozone destruction. And the coolant cars use, R-12, is the most ozone-deadly. Yikes.

Avoiding potholes will preserve your car's AC and its CFCs. Using the air conditioner as little as possible will reduce overall stress on the system; many cars have an economy option that lets you circumvent compressing the coolant for fan-only operation. When cooling the car with AC, remember to close all vents that allow in outside air. (Gasoline-wise, at highway speed, you'll burn less running the AC than driving with the windows down.)

Have your car AC tested for leaks each spring. Repair the holes; don't just keep refilling the coolant. A vampire machine to capture vented CFCs is required at all General Motors service departments. Increasingly common at corner garages, over 160,000 such machines have been sold.

How to replace what has leaked? CFC coolant is still available, and will be until a production ban trickles down, but the price is already starting to rise. Alternative coolants such as HCFCs can increase gas consumption unless ACs are retooled. By the end of 1993, all Nissan and Infiniti cars sold in North America will come with HCFC coolant. But because HCFCs will leak, too, and destroy some ozone, these systems are just a half step.

Mazda's full step, an option available only in the luxury 929 sedan, is a sunroof implanted with solar power cells that operate two heat-exPELLing fans. Out of your range? Try a solar fan you can install on the window of any old clunker. Other mobile measures:

- Window tinting to cut down on sun glare is a must in the South; some states, though, regulate the tint. A light-colored cardboard or nylon sunshade is de rigueur for the windshield of your parked car. For side and rear windows, try the roll-down blinds — roll them up before you drive.
- Portable fans can go on the road using an adaptor plugged into the dashboard cigarette lighter. Hand-held, battery-operated fans (rechargeable, of course) are also available. Ventilating mesh seat-covers will reduce clothing wrinkles and vinyl burn. All these gadgets are available at auto-parts and department stores.

LOOKING

FOR

MISSTER

GREENBAR

A super-scientific, double-blind study of mating behavior among *homo sapiens environmentalis*. No, really. BY HANNAH HOLMES

M

Y FRIEND TELLS ME ABOUT HER BROTHER, AND how he fell in love: He was setting his garbage out one day when a woman from down the street took issue with his placement. They argued. He suggested settling it over dinner. They now share his house, her cats, and presumably, garbage duty. ♡ Listening to this tale of trashy romance, I am nipped by curiosity. I want to know how greens meet people their own color. I wonder what special pitfalls await them. I wish to study the mating habits of *homo sapiens environmentalis*. ♡ And where better to start but the Wetlands Preserve in New York City? As I approach this “watering hole for activists,” a saxophonist is warming up softly, standing atop the wheelchair ramp, just under the huge wooden sign carved with a heron in a marsh. Inside, all is quiet. Cripes, it’s only 9:00 pm — time for a late lunch, in New York. ♡ But there are two young lawyers at the end of the bar, talking quietly. They’re nwuppies, they say — non-working urban professionals — who discovered the Wetlands six months ago. Marie sums up the allure thus: “Most of the boys in here have long hair and have played the guitar at some point in their lives.” ♡ Virginia concurs, with a troubleacious grin. “You just *know* they’re aware. They have to think up ways to let you know they’re open-minded. Sometimes I bring up subjects to test them.” ♡ Like abortion. Virginia and Marie say abortion is a great conversation starter at the Wetlands. ♡ Thinking that’s a little strong for me personally, I set my sights on a couple of gentlemen twirling their beers on the bar, and try a softer approach. ♡ “So, do you guys recycle?” ♡ They turn and give me that stony New York stare that makes me wish I’d been mugged on the way over. “We’re here



Photography by
Jonnie Miles

to listen to the band," they say. Right.

I turn my charm-beams on a trio of younger men (long haired, in fact), one wearing an Earth Day 1992 T-shirt. "Is abortion truly the conversation-starter of the nineties?" I ask.

"You know what works for me?" one of them asks. "'How do you like your eggs in the morning?'"

It's clearly not my lucky night. I wander into the political corner, and have a look around. Huge calendar of events: lectures, demonstrations, screenings, Tuesday night "Eco-Saloon" topics. Tons of free literature. Petitions to sign — to Procter & Gamble to protest animal testing; to GE to protest nuclear gizmos. Oops, the petitions are illuminated with forbidden light bulbs — only GE makes these red ones.

Parked in the "Earth Station" is a sixty-something VW bus, wildly painted, and caked with bumper-stickers. Inside the bus is a glass case of buttons and bumper stickers; organic cotton T-shirts hang from the roof. Over the door a sign reads "Register To Vote." Behind the counter is Kathy Kane, 24, who with James Hansen, 27, coordinates the environmental events at the club. From the bus, they watch the green social scene unfold. For the most part, Kathy says, green singles are just like the rest of us. "But I see some of these activists around me — these people will do anything for the environment. But they're a little strange, you know, socially. They have like 22 cats and they twist themselves up until they're about to collapse." Ah-hah! Confirmation of my theory that many strident environmentalists are suffering from deep neurotic disturbances. Get tangled up with one of these types and in seconds, you'll be dysfunctioning all over the place.

But it's 11:00 pm and I have 19 appointments in the morning. Though there will be 200 throbbing activists here when the band starts at midnight, I can't stay to watch.

Getting Personal

SAVE MOTHER EARTH! ELIMINATE FOSSIL FUELS! LEGALIZE HEMP for fuel, paper, food, clothes, and medicine!"



I could be reading this off the bus in the Wetlands, but no. It's a personal ad. This SWM, 35, is into biodiversity, abortion rights, population, and computers. He's looking for an animal lover with whom to read, write, hike, and bike. He's looking in the right place.

His ad ran in the *Concerned Singles Newsletter*, a compilation of 600 to 800 personals from all over the country — and outside it. Some others:

- An athletic eco-entrepreneur, 32, with some deforestation on top, not interested in fluffers or fanatics.
- A SWF vegetarian nonsmoker, 26, into nutrition, the environment, travel, etc., looking for a man of similar qualities.
- A "Roseanne" type environmentalist/teacher, 39, into organic gardening, camping, wolves; seeking a funny, bearded, family-minded man.
- A romantic, humorous, bearded guy, 32, into dancing, tennis, and hugs, although preferably at different times.

Like the Wetlands, services like Concerned Singles function as a screen. These meeting venues eliminate the thousands and thousands of people out there in Singleland whose fundamental values are so different from your own that you could spend your first date brawling.

"People with highly developed interests tend to be more particular," agrees Anne Lambert, founder of Science Connection, another dating service. "There's a myth that single people are desperate. I think it's almost the contrary: They're happy single, and things have to be pretty good to change that."

There are other advantages to these services. "These things work best for people like me who live in the boonies," says Natty Bumpo, a self-named Kentucky attorney with no small amount of expertise on the subject. "I'm out here in the sticks and I don't run into people I like to communicate with every day." Natty joined eight services, corresponded with 138 women, married one, and wrote a book about it (see Resources, p.33). His analysis: "It's not as fast as meeting someone in a bar, but it's more efficient. You exchange a few letters or phone calls with someone, and you'll find out if they're a nut or not."

Signe Waller, a 53-year-old researcher who met and married a 54-year-old farmer through Concerned Singles, also recommends the paper approach. Through an expensive dating service in Milwaukee she met men, but they didn't share her deep ecological and social values. "I had a few dates, but they were just men. And that didn't interest me." Jim Rose found Signe's Concerned Singles ad on the last month of her membership. The happy couple now runs an organic subscription-farm in central Indiana.

This is how it works: You send your membership fee to a service (\$45 to \$65 for 12 months), along with a brief ad that includes your home town and state. Periodically, you get a list of





James Hanson and Kathy Kane mind the store at the Wetlands.

all the ads from opposite-sex members. When you see an ad you like, your frantically self-conscious scribbles may take various routes to the object of your affection. In some services, you write to a box number and the service forwards your letter. In others, if you like the short ad, you pay for a long biography that includes a name and address. And some services publish the addresses of the advertisers outright. (For a list of services, see Resources.)

If you're the do-it-yourself type with a computer and modem, the WELL (Whole Earth 'Lectronic Link) is a great spot to post your own electronic personal ad (again, see Resources). The online "Singles Conference" is peopled with witty, wordy progressives who babble irrepressibly about anything that moves — your ad could catalyze a gambolling discussion of sexual politics or plate tectonics. Quoting from the WELL is taboo, so you'll have to trust me: For a meeting place composed of bits, bytes, and gray computer-screens, the WELL is a downright sweaty place to hang out.

Insider Trading

IN RANK DEFIANCE OF THE "DON'T-DATE-YOUR-CO-WORKERS" AXIOM, some environmental organizations are excellent places to observe mating behavior. The yeasty atmosphere at Greenpeace, especially in years past, regularly produces what are known as "Greenpeace couples."

"There has always been a fair number of Greenpeace couples," says Jeanne Kirby, 29, who coupled with Dave Rapaport, 32, in the D.C. office

in 1986. "It wasn't terribly out of the ordinary." The two married in 1988 (roughly half the 100 guests were Greenpeace people); they now work together on a coral reef project out of the San Francisco office. They were scheduled to spawn at the end of June.

But courtship in the line of duty can be hazardous, office politics aside. When they met, Dave was directing the U.S. Toxics Campaign, and traveling heavily. "Sometimes, I'd get involved in an Action just so I could see him," says Jeanne. "He'd be the one sitting in an office with the phone in his ear organizing things, and I'd be the one that ended up getting dirty, and hanging from things, and going to jail."

The PIRGs are another steamy place to work. Each summer some 5,000 college students from all over the U.S. and Europe migrate to the state and local offices of the Public Interest Research Groups to learn the fine art of canvassing — banging on doors and begging for money. In addition to learning about environmental campaigns, lobbying, and fundraising, they get a little money and a lot of social stimulation. There's the Wednesday night pizza party (pizza and beer party, according to my inside sources), a sort of communion shared by every PIRG office nationwide. Then there are the more impromptu games of volleyball or mini golf. And of course, there are the truly impromptu hormonal sports that college youth are famous for.

"The schedule is pretty good — 2 to 10 pm," says Deirdre Cummings, the Massachusetts regional field coordinator. "They can hang out and party all night." If the PIRGs come recruiting at your campus,



be aware that the California and Cape Cod offices are hot spots. You can call them at (800) 75-EARTH.

If you can't get hired at Greenpeace, and you're too old for the PIRGs, perhaps you should crash a BASH. Bay Area Society for Happy Environmentalists was hatched last winter by a couple of guys from the Natural Resources Defense Council and a guy from Greenpeace. "It was founded on no serious principles," asserts Chris Calwell, one of the NRDC guys, whose age, like that of most BASHers, lies somewhere between 22 and 35. "Cheap drinks and free appetizers are prominently featured. At first we had minutes, but they were too long-winded, so we now have seconds: 'This is where we met last time and here's where we meet next time.'"

The members, who include employees from other environmental groups in San Francisco, regulatory agencies, and utilities meet for happy hour the first Thursday of the month and don't discuss work. They are free to appoint themselves to the Acronym Committee, the Committee Committee, or any other office they care to dream up. But the outlook is troubled: The singles are doubling up and reproducing. "The mineral-water crowd is making a strong advance," Chris says.

Don't sound so glum, Chris — if the singles scene isn't ultimately about mucking around in the gene pool, what is it about?

Well, having traveled the world in search of the ideal meeting venue, I still felt something was missing from all the hangouts I'd found. So I called my friend Liz and we schlepped down the street to our local Maine Outdoor Adventure Club. There were 100 people churning in the church basement, and 100 percent of them looked healthy, happy, and sun-tanned. It happened to be the opening night of *MOAC: The Video* — a goofy montage of photographs from previous outings, showing collapsed igloos, deep-snow headstands, and other courageous feats. Between the video and the spontaneous narration from the audience, I giggled uproariously. The guy sitting beside Liz batted his blue eyes and asked to borrow her pen. He introduced himself. She blushed.

We're joining.

Resources

Concerned Singles, Box 555, Stockbridge, MA 01262. Dating service. Peace, justice, environment are common themes. All ages, but most in 30s and 40s.

Science Connection, P.O. Box 188, Youngstown, NY 14174-0188. Dating service. Scientists and science buffs, including teachers, bird-watchers, etc. Occasional group outings. Again, many 30s and 40s.

At The Gate, P.O. Box 09506, Columbus, OH 43209. This one is Natty Bumppo's favorite dating service. It's got an environmental focus for all ages.

Lonely Hearts, by Natty Bumppo. 310 pages. Borf Books, Box 413, Brownsville, KY 42210. \$16.95 ppd. Selected letters and telephone transcripts from Mr. Bumppo's journey through eight services to marital bliss.

The WELL, 27 Gate Five Rd., Sausalito, CA 94965; (415) 332-4335; modem (415) 332-6106. Sprawling computer network of on-line conferences with a progressive bent and a boisterous, intelligent membership.

Contraceptive Guilt

(Or... It's Not Green Being Easy)

GET LUCKY? Now the guilt sets in. No, silly, not the pre-marital-sex variety your mom failed to instill in you — contraceptive guilt. Yup, your noble effort to stem overpopulation may have worsened the ozone hole, the greenhouse effect, and the garbage crisis. Yessiree, sex is fraught with environmental peril.

Take the humble condom. Once handsewn from biodegradable animal innards, they're now made from slow-degrading latex. There are even rumblings that the ring at the end degrades so slowly that it presents a hazard to water creatures — you know, picture a sea bird with a condom ring stuck around its neck. Worse, as condoms have come out of the closet, the marketing geniuses have spruced up their presentation. One brand now comes packed in a purple plastic box that resembles a large make-up case. Add to that the fact that condoms are vulnerable to pollution — ground-level ozone smog from burned fossil fuels, and ultraviolet radiation that sneaks in through the stratospheric ozone hole — and the condom looks like an environmental torpedo. On the bright side, latex is a sustainably-harvested rainforest product, so perhaps your copious usage could turn the tide of deforestation and save the world.

Then there's contraceptive foam. These spermicides are among the small number of spray products that still use ozone-layer-zapping CFCs as propellant, because they're relatively non-toxic. Although manufacturers are looking to other propellants, these tend to be hydrocarbons that not only cause smog, but are also flammable. In the words of the FDA's Dr. Martin Bennett, "I would say that if the person using this foam was smoking, they could have a hot time." Koromex uses CFCs; Ortho's Delfen foam uses a hydrocarbon.

Foaming suppositories are a different animal. Activated by body heat and moisture, they operate on the same vinegar-and-baking-soda principle that caused your volcano model to erupt in high school. This reaction releases CO₂, the quintessential greenhouse gas, so consider planting a tree to absorb your emissions.

The Pill presents a classic case of overpackaging — layers and layers of plastic. The reusable diaphragm generates only spent tubes of goo, but then, rumor has it a disposable diaphragm is coming down the pike.

A relative newcomer to the contraception scene is VCF, a dissolving film impregnated with the spermicide, nonoxynol-9. A 2.5-inch square arrives wrapped like a condom. In the body the film melts, slays sperm, and is eventually flushed out. Too bad the film is a polyvinyl-alcohol plastic.

Hey, if contraception is so problematic, rife with threats to the earth, sea, and sky, where are the eco-preneurs? Where's the bacterium that spits up spermicidal foam? Where's the organic plant-gel? Who's going to perfect the washable cotton condom? We greens are waiting with crossed legs.

RAINY DAY EARTH GAMES

It's summer, and the kids are out of school. On the third rainy day in a row, your little angels have become little hellions — the dog is wearing poster paint, and there's a pillow fight raging in your bedroom. Don't despair. Round up your at-home wildlife and harness their energies for games that teach about recycling, composting, and saving energy.

PAPERMAKING

TEAR SEVERAL SHEETS OF PAPER INTO ONE-INCH SQUARES, AND SOAK THEM IN WATER OVERNIGHT. Next day, put 1/2 cup of soaked paper in a blender and fill it with water from the soaking container. Blend for 30 seconds to separate wood fibers. (You can see them with a magnifying glass.) Suspend an old window screen over the sink, and pour the pulp onto it. Place a layer of newspaper over the pulp and press out excess water. Turn the screen and newspaper over, and set it on a table. Slowly lift off the screen, and press out more water with fresh newspaper. Repeat the pressing on both sides; peel off the damp (outer) newspaper and let your recycled (sandwiched) paper dry.

ENERGY DETECTIVE

THE GOAL? FIND ALL THE ENERGY-USING DEVICES IN YOUR HOUSE AND SHUT them off. The judge is the spinning electrical meter: When it stops, you've cracked the case! (The disk may take a moment to stop moving.) Hints: Some appliances keep using electricity until you unplug them. Water heaters and air conditioners may be wired directly into the house circuit, so you'll need to shut them off at the fuse box.

PURE PLAY DOUGH

YOU CAN MAKE A DOUGH AT HOME THAT PLAYS JUST LIKE THE COMMERCIAL STUFF, WITHOUT THE price tag for the packaging. Boil 1/2 cup salt in 2 cups water until the salt dissolves. Add enough food coloring to darken the water, then stir in 2 tbsp. salad oil, 2 tbsp. cream of tartar, and 2 cups flour. Knead, and it's ready to roll. Store in an airtight container.

START A WORM FARM

FILL A PLASTIC DISHPAN WITH FIVE INCHES OF DAMP NEWSPAPER STRIPS, DIPPED IN WATER AND squeezed out. Mix in a few handfuls of decomposing leaves and dirt (worms use grains of dirt to grind up what they eat). Now find some tenants — look under rotting leaves, near the compost pile, or at a bait shop. Put the worms in the box, and lay a piece of a dark plastic-bag over the bedding. Now fatten 'em up — they especially like lettuce and melon! Each worm can gobble about 1/2 ounce a day, and their dark, rice-sized "castings" are great food for your houseplants. If you have very happy worms, they'll multiply. Look for tiny, yellow cocoons.

WHAT'S IN THE WATER?

WHY IS CLEAN WATER SO IMPORTANT TO LIFE? GATHER A BUNCH OF white flowers and put them in a vase with water. Add a squirt of food coloring. In a few days, when you see the flowers turn color, you'll know why water pollution is dangerous: Water, and the chemicals in it, become part of all living things.

— DEBORAH DEPEYSTER

ROBINS

THE ECOLOGICAL COST OF DYING

BY NANCY BRUNING



MEET MR. JONES.

You'll forgive him if he doesn't rise to the occasion. You see, whether Mr. Jones was a CEO or a plumber, a Republican or a Democrat, he's now part of the solid-waste stream. As such, he must be disposed of. But unlike an empty orange-juice container, Mr. Jones will not be unceremoniously dumped in a landfill or sensibly recycled. Oh no ... in all likelihood, Mr. Jones will be pumped full of chemicals, packaged in thousands of dollars worth of finely crafted materials, and lowered into hallowed ground forever. Funeral practices in the U.S. prove you can take it with you — the more the better.

Environmentalists and people with other concerns are taking a hard look at how we currently dispose of the two million Americans who die each year. A growing number feel that disposing of human remains consumes an unconscionable amount of money and



resources that could be put to better use for the living. In addition, there are growing concerns that the dead come back to haunt us in the form of water, soil, and air-pollution problems.

We all have to face the unpleasant fact that there's no alternative to death. But there are alternatives to the way we currently handle our dead, which may prove to be not only gentler on the environment, but also may allow us to better fulfill the needs of the loved ones left behind. Although we may not want to think about it, we can and should take responsibility for the disposal of our own bodies, just as we have taken responsibility for other aspects of our lives.



**Americans
spend about
\$6,000,000,000
on funerals every
year**

BIG TICKET: A CASKET

UNTIL THE END OF THE 19TH CENTURY — AS JESSICA MITFORD documents in her classic expose of the funeral industry, *The American Way of Death* — American funerals were simple affairs with plain pine boxes and laying out of the body by family and friends who also bore the coffin to a nearby grave. Today, our affluence and our shrinking and scattered families have set the perfect stage for the growth of the funeral industry. Americans have gradually turned over to strangers the intimate and meaningful tasks that in earlier times were the responsibility of those who knew and cared about the deceased.

"What a waste of resources," marvels Lisa Carlson, author of *Caring for Your Own Dead*. It's not unusual for an American to "bury \$5,000 in money and materials" along with the corpse. She's not kidding: According to the National Funeral Directors Association, the tab for the typical (adult) funeral ranges from \$2,500 to more than \$8,000. With 2 million deaths at an average cost of \$3,000, that adds up to about \$6 billion each year.

Caskets, the most expensive item on a funeral shopping list, are available in copper, bronze, or steel or expensive hardwoods; with cushioned velvet or satin interiors; and inner-spring mattresses and orthopedic beds. A three-inch thick, polished mahogany model will set your estate back around \$12,000.

It's not enough to have a fancy box for the body — there must be a vault to encase the coffin below ground. Manufacturers imply that vaults, made of concrete, steel, or fiberglass, offer permanent or prolonged protection for the body. There is no real evidence of this, and they're not required by law. They're often required by cemeteries, however, which claim they're necessary to keep the ground from collapsing as the coffin disintegrates.

Other typical costs and materials involved in laying Mr. Jones to rest include the purchase and maintenance of the plot, opening and closing the grave, professional services such as transferring the body to the funeral home, plus a thousand little extras. One of the biggest extras is surely the masses of flowers that accompany us to our graves. According to the Consumer Reports book *Funerals: Consumers' Last Rights*, "the conventional American funeral typically includes about twenty floral displays in addition to those provided by the survivors." The retail florist industry doesn't know how much is spent on sympathy flowers, but estimates are about 20 percent out of \$3 billion annually. A lot of money, labor, land, water, and horticultural chemicals

are marshalled for sending you out in style, not to mention the separate "flower car" to haul the arrangements to and fro.

Of course, before the funeral begins the body gets a good chemical going-over. While embalming is usually part of the funeral goods-and-services package offered by funeral homes, it's practically non-existent outside the U.S. and Canada. In most cases it isn't necessary, or even required by law.

Originally, embalming entailed soaking the body in preservatives and then wrapping it, mummy style, in cloths soaked in preservatives. Today's higher-tech embalming involves removing the blood, other body fluids, and wastes and replacing them with a preservative, usually formaldehyde. Currently, embalming is legally required in certain states only

under certain conditions, such as shipping the body out of state or death due to a communicable disease.

Our modern version of this ancient art serves mainly to preserve the body long enough so it can be restored (via cosmetics) to an attractive, life-like appearance and so friends and family can see the body one last time. As such, it encourages the use of fancy caskets, clothes, and flowers to create a precious, indelible, and perfect "memory picture" of the dead, which funeral directors claim is an essential component of "grief therapy."

But do formaldehyde and other embalming chemicals create another kind of picture by seeping into groundwater? Canadians have done test drillings in cemeteries to check the water supply, finding no contamination. The U.S. government may follow suit, but the funeral industry doesn't expect this to be a problem — it says the expensive vaults that line the graves are supposed to prevent such seepage. The Environmental Protection Agency also isn't particularly worried because the volume (i.e., number of dead bodies) is relatively low, and thus the chemical concentrations probably aren't high enough to cause a problem. So far, there's been no documented groundwater pollution. Environmentalists are still worried.

"It's not a major form of water pollution," agrees Bob Collins of Clean Water Action. "But it is a concern, because we don't know what measures [cemeteries] take to protect groundwater."

There is also concern about the blood and other body fluids removed during embalming, which are usually flushed untreated into municipal sewer systems. What if the fluids contain infectious agents or toxic chemicals used to treat certain diseases? And contrary to popular myth, embalming doesn't completely sanitize the body — tuberculosis, smallpox, anthrax, and HIV pathogens have all been found in embalmed bodies.

RUNNING OUT OF GROUND?

MOST AMERICANS EXPECT AN IN-GROUND BURIAL WHEN death comes. In the 1970s, the National Association of Cemeteries estimated that all available cemetery space would be used up for ground burial in about 90 years. Steven L. Morgan, executive vice president of the American Cemetery Association, counters that space is "not considered to be a problem of sufficient concern or magnitude — it's not something that



WHILE NO ONE KNOWS HOW MUCH LAND AREA IS
DEVOTED TO THE DEAD, ONE SOURCE SAYS AT LEAST
1,200 BODIES CAN BE BURIED IN ONE ACRE OF LAND.

we in the industry discuss." But he admits "there are no definitive studies [on future land availability]."

John T. Bailey, general manager of Greenwood and Mount Olivet cemeteries in Ft. Worth, Texas, insists that cemeteries located only in and around urban areas are running out of land. Mr. Bailey says that the "real wasted space" is when families buy a large plot, erect a monument, and then move away. "There are many 20-foot by 20-foot plots designed to hold 12 bodies, but contain only three or four." The result? We send our dead farther and farther from where we live, and travel more miles to visit them.

While no one knows how many cemeteries there are in the U.S., an accepted guess-timate is around 100,000. That said, we still don't know how much land area is currently devoted to the dead. How much land *will* be capped with tombstones was predicted in a 1975 article in the *New York Times*, when one of the largest insurance companies said that unless new burial procedures were adopted, in 500



In Tokyo, space is at such a premium that the grave sites are recycled every three years.

years every acre in the U.S. would be taken up by cemeteries! Could this be true? Not according to Mr. Morgan, who says that at least 1,200 bodies can be buried in one acre of land.

Regardless of whether these calculations pan out, there are those who argue that setting aside space for the dead has tangible advantages for the living. It helps provide a sense of "roots" and continuity. Frederick (Ric) Newton, past president of the California Funeral Directors Association, is not alone when he characterizes cemeteries as buffers of open space in the midst of urban development.

The five Forest Lawn Memorial Parks in southern California, comprising a total of 290 acres, take this concept just about as far as it can go. They offer organized community activities, museums housing works of art, and concerts (such as the Los Angeles Mozart Orchestra memorial concert during the cultural event "Deathfest 2000"). In 1991, Forest Lawn began a water-conservation program, since it's located in a region that is experiencing a severe water shortage. It uses enough reclaimed water to save the equivalent of the water used by 2,000 households each year, and hopes this and other measures such as landscaping with drought-resistant plants will serve as a role model for other facilities requiring irrigation.

DEALING WITH DEATH

Organizations

- Continental Association of Funeral and Memorial Societies, 6900 Lost Lake Road, Egg Harbor, WI 54209; 800-458-5563. *A consumer organization representing 147 memorial societies in the U.S. It provides info about simpler alternatives to traditional funerals; emphasizes pre-death planning.*
- The American Red Cross, 1-800-2-TISSUE; The American Council on Transplantation, 703-836-4304; or your local medical center. *For info on how to arrange for organ and tissue donation.*
- Cremation Society of North America, 401 N. Michigan Ave., Chicago, IL 60611; 312-644-6610. *A trade association that provides pamphlets on cremation; send SASE.*

Books

- *Caring for Your Own Dead*, by Lisa Carlson. Upper Access Publishers, P.O. Box 457, Hinesburg, VT 05461; (800) 356-9315. \$14.95 ppd. *A state-by-state guide for those who wish to handle their own funeral arrangements.*
- *The American Way of Death*, by Jessica Mitford. Out of print; check your library. *A classic expose of the excesses of the funeral industry.*
- *Funerals: Consumers' Last Rights*, by the Editors of Consumer Reports. Out of print; check your library. *A good, basic reference on all aspects of funeral-shopping. Published in 1977, the statistics are outdated.*
- *Mortal Matters: When a Loved One Dies*, by Sara Engman. Andrews and McMeel, 15560 W. 110th Street, Lenexa, KS 66219; (800) 826-4216. \$8.95 ppd. *Sensitive-ly handled guide to coping with a loved one's death.*

ASHES TO ASHES

CREMATION MAY SEEM LIKE THE PERFECT SOLUTION TO OUR burial problems. It offers several advantages: It can be cheaper than conventional burial. Since there doesn't have to be a viewing of the body, there need be no embalming and you can use a simpler container. In addition, cremation destroys disease-causing pathogens, a growing concern among health professionals, especially in regard to viruses such as hepatitis and HIV. "The average temperature in the [burning chamber] is 1,700 degrees F., and we know of no pathogen that can survive that temperature," says Jack Springer, executive director of the Cremation Association of North America.

The most potent attraction, however, is that the remains, or "cremains," take up less space. Instead of a full-sized plot (40 inches by 10 feet by five-feet deep), Mr. Jones can be buried in a much smaller grave. Or he can spend eternity in an urn. His family can even scatter his remains on land or at sea. Regulations regarding ash scattering vary from state to state; some cemeteries have special "scatter gardens" for this purpose. In England, a company is offering to arrange for pub customers to have their ashes interred in their favorite drinking establishment.

Shrinking cemetery space and societal preference make cremation popular the world over. Canadians cremate 25 percent of their dead; Europeans around 50 percent; and in Japan it's the most common method of disposal. Cremation is also catching on in the U.S., where 17 percent of corpses are cremated. The industry projects that by 2010, 27 percent of us will return to ashes after we die.

Jack Springer says older people are opting for cremation because it can be less expensive (it's often coupled with a simpler funeral). Younger people have a different focus of interest. "They

like the idea because they won't be using the land."

But cremation, like any form of incineration, concerns some environmental groups. Crematory emissions that fly up the smokestack contain pollutants including mercury from silver-amalgam dental fillings and heavy metal residues from cancer chemotherapy. Clean Water Action estimates that, in the U.S., cremations emit annually 1.5 to 2 tons of mercury. While that's hardly a wisp when compared to the 45 tons of mercury that pour out of trash-burning incinerators, cremations often occur in highly populated areas. Newer crematories have after-burners and scrubbers which keep emissions well within federal standards, but most lack high stacks for dispersing emissions — so pollutants that aren't filtered are likely to affect residents in nearby neighborhoods. Also, crematoriums might have a problem meeting some states' new air quality laws, which are often tougher than federal standards.



**Americans cremate
only 17% of our
dead, Canadians
25% and Europeans
about 50%.**

THE 3 R'S OF FUNERALS

WHILE MOST OF US WISH TO MARK THE PASSING OF A fellow human being, material extravagance does not have to be part of the picture. There are plenty of ways to make the passing of a loved one more meaningful, while causing less damage to our wallets and the environment.

We can reduce waste in the first place by simplifying the funeral. Many people are opting for an immediate burial or cremation — without embalming, fancy accessories, or formal viewing. If you plan ahead, you're less likely to bow to pressures from family or the funeral industry. Comparison shop for funeral homes, find a funeral director who will give you what you want and no more. In the death notice, you can request "no flowers" or that a contribution be made to a charity instead.

You may wish to join a memorial society. These volunteer groups gather information on prices and arrangements, help you find cooperative funeral homes that have reasonable prices, and make your planning easier. By helping us counteract the tendency toward "ignorance and avoidance," they can also help us deal with an industry that, according to Ernest Landauer, executive director of the Bay Area Funeral Society in Berkeley, Calif., tends to exploit "sentiment to maximize profit."

A further step toward assuming more control is the do-it-yourself route, which costs less and may be a better way to say goodbye. Over 40 states allow a family or religious or support group to bypass a funeral director. How? You become the general contractor, dealing with the state, the coroner, the limo, the crematorium, the cemetery, etc.

Whether you work with a funeral director or do it yourself, remember this: The biggest ticket item in terms of wasted money and resources is the casket. There are many options that are cheaper and may also be better for the environment. Some funeral homes will rent a casket for viewing purposes. Or you could opt for a plain pinewood box which may be covered with cloth. Particleboard coffins are available for a few hundred dollars. Funeral establishments cannot require you to purchase a finished casket for a body to be cremated, but can require an unfin-

ished box or other container for ease in moving the body. Boxes made of corrugated-fiber or hard cardboard are often used for cremation, and cost as little as \$10 in some places. An Australian company has won government funding to make the ultimate in ecologically correct coffins — using recycled newspapers (out of the obits, undoubtedly).

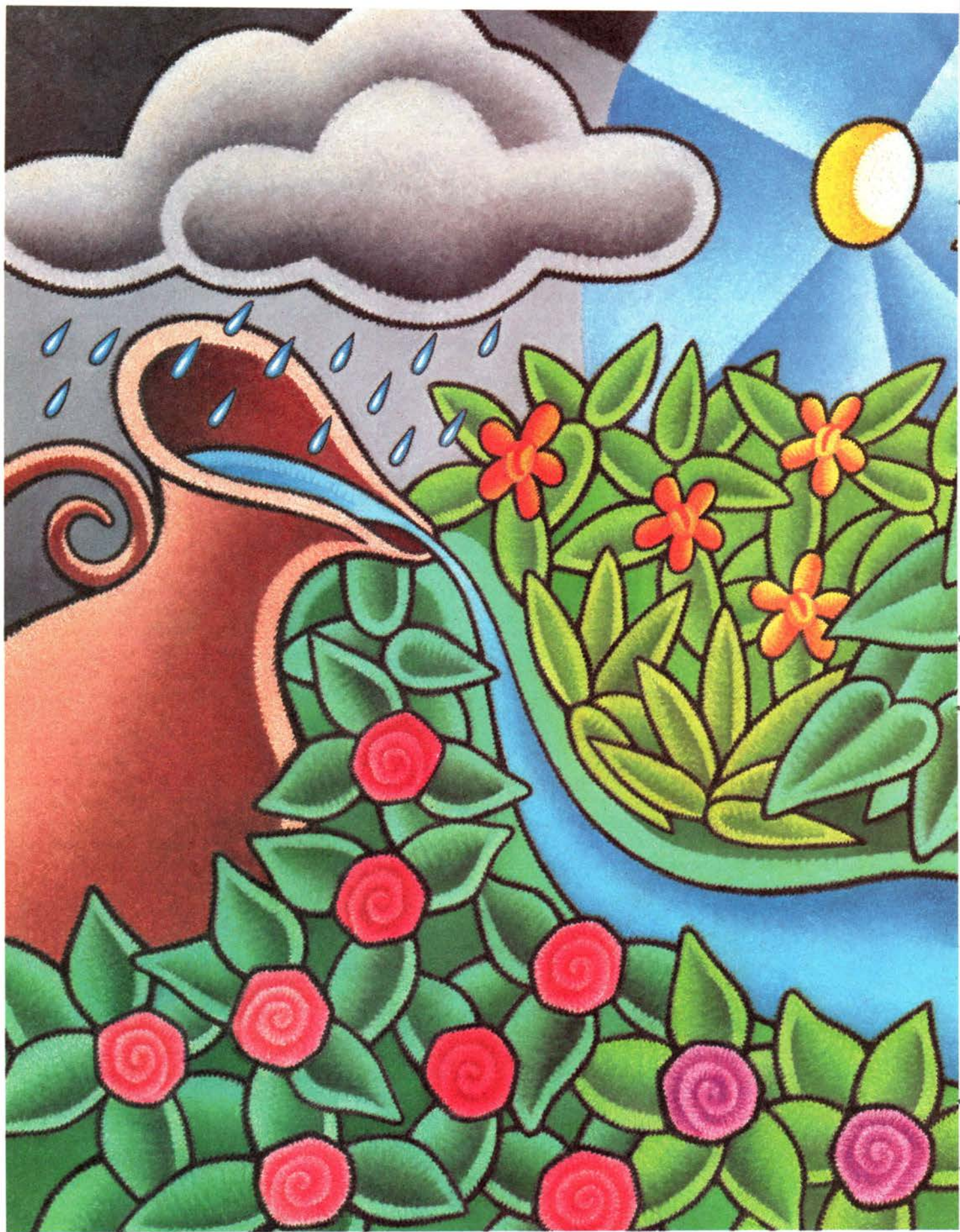
For those to whom recycling is paramount, bodies and body parts can also be reused. Before the final disposition of the body, organs and other body parts can be donated for transplanting to other human beings. Or you may donate a body to a medical school for use in research and education. (The school will often pay many of the costs associated with disposition, and some return the remains or cremains to the family upon request. However, heavy-duty embalming is required for medical-school cadavers.)

Then there's the ultimate back-to-the-land movement, whose proponents are growing. D.W. Peabody, author of the *New York Times* article that predicted coast-to-coast cemeteries in 500 years, notes that "the ideal thing would be to bury them [the bodies] immediately after death, without embalming them, in places where they could disintegrate naturally and the elements return to their respective cycles." Long ago, an architect drew up plans for a cemetery where coffins and vaults are banned and bodies are wrapped in burial cloths and placed in unadorned graves. The land could be endlessly recycled and accommodate unlimited burials if we were to allow humans to turn to compost.

To witness this approach, visit the Greenwood Cemetery in Fort Worth, Texas, which has a "churchyard section" where bodies are buried six-feet deep in biodegradable wood coffins. The survivor pays for using and maintaining the grave for 20 years. By then, the body and coffin have disintegrated. Only the bones remain. Cemetery Manager John Bailey explains that "bones don't take up much space." He took his cue from Europe, where biodegradable burial is common. In Tokyo, space is at such a premium that the grave sites are recycled every three years.

Speaking objectively, this approach does seem to make the most sense — it conserves land, preserves green open spaces, poses less of a pollution risk, and returns nutrients to the natural cycle. Although hard-nosed realists point out that reusable graves might take time to catch on, nothing is impossible. In a fascinating article in the *New York Academy of Sciences'* publication *The Sciences* (Nov./Dec. '91), anthropologist Aubrey Cannon traces the role of "fashion" in burial customs. Through history, the pendulum has swung between extravagance and restraint, with now one, now the other signifying social standing and correctness. In our time, ecological and economic concerns are uppermost on our minds. Perhaps expensive funerals will come to be seen as dishonorable, and the simple, natural burial as more worthy of respect.

Nancy Bruning is a San Francisco writer specializing in health and the environment. Her books include *Cities Against Nature* (Children's Press), *The Real Vitamin and Mineral Book* (Avery Books), and *Coping with Chemotherapy* (Ballantine).





EVEN DURING DROUGHTS CISTERNS DELIVER RAINWATER



by Robert Kourik THEY COME IN ALL SHAPES AND sizes: rain barrels connected to the roof's downspouts, unappealing plastic drums, no-nonsense concrete tanks, pond-size "reservoirs." Cisterns are used throughout the world to catch rainwater for irrigating. Years ago, they were an essential homestead component for washing and drinking as well as watering. But with the development of better well drilling equipment and reliable electrical pumps, rural homes abandoned water "harvesting" in favor of deep rock or shallow wells. As urban centers matured, centralized water-distribution services expanded. Water appeared at the tap, so why bother with a cistern? ♻️ Well, times are still changing. Cisterns are coming back, due to dwindling sources of clean water,
Illustration by Margaret Kasahara

erratic supplies during droughts, and a renewed interest in water independence.

The Good Old Cistern

COMPARED TO MANY MODERN TECHNOLOGIES, CISTERN SYSTEMS are pretty simple. Rainwater is gathered, stored in a tank, and drained or pumped to the landscape. In most cases, rainfall is collected from the roof of your house, barn, or garage. A gutter funnels the rain into a downspout, hose, or pipe, which connects to the cistern itself.

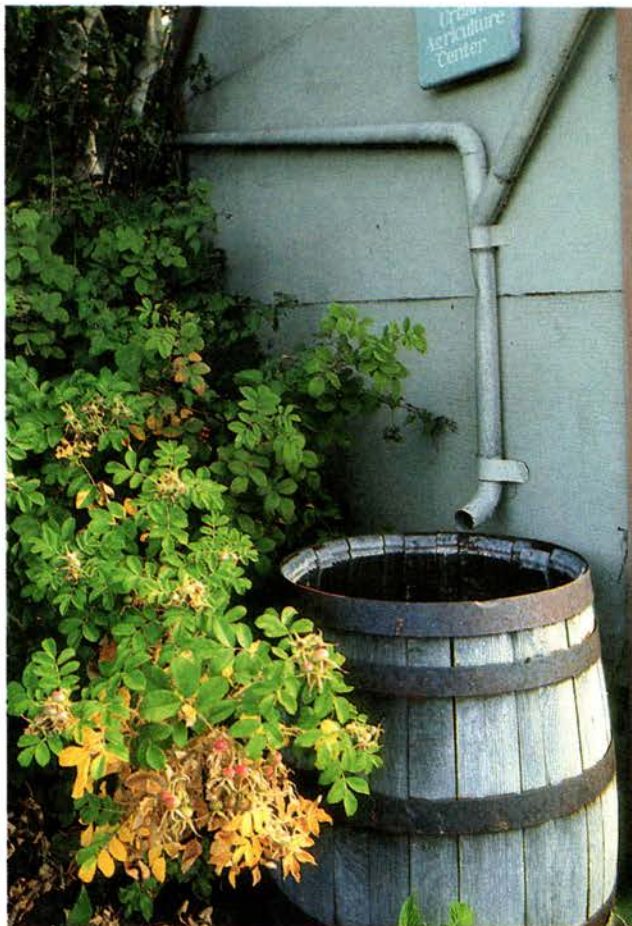
If all the landscape to be watered slopes downhill from the cistern, the stored water is drained by gravity. Unless water from the cistern flows down a sizable hill, gravity-fed systems don't develop much water pressure, so the homeowner usually waters by hand with an open-ended hose. Of course, a pump attached to an above- or below-ground storage tank would provide the pressure to power sprinklers and drip-irrigation systems.

Even when it rains periodically, cisterns are a gardener's ally because they provide a healthier quality of irrigation water. Most municipal water systems use chlorine as the primary purifying chemical. While the experts argue the health risks of chlorine, most gardeners will tell you their plants look and grow better with rainwater. Repeated use of municipal water, especially in arid climates with alkaline soils, seems to have a mild adverse effect over time — browning of the leaves' edges and perhaps yellowing. (For many people, a rain barrel under their home's downspout is a *must* for watering indoor plants. The salts and minerals found in many water supplies build up in the pot's soil, threatening sensitive houseplants.)

Alas, we can no longer play homesteader and use cisterns to collect *drinking* water. In much of the country, especially in and around urban areas, the air is laced with pollutants ranging from volatile organic compounds to suspended particulates to lead. Soil is a natural filtration system, so your plants can thrive on cistern water. You can't. A well-designed cistern system does have a mechanism that manually flushes out dirt or residue before storing water, but no single system filters reliably all the chemicals that infiltrate rainfall.

Droughts are often enough inspiration for the installation of cisterns throughout the West, if not everywhere. The recent, already infamous six-year drought in California (which was washed away in portions of the state this past winter but hangs tough in other areas) has given rise to more cisterns than we've seen in decades.

Ironically, cisterns in regions with barely a trickle of summer rainfall are expensive propositions. In such an area, you must store enough water for as much as six months of landscape irrigation. Consider an anonymous, two-acre estate in a wealthy



The archetypal cistern: An old wooden barrel captures rain from the roof of a Seattle greenhouse.

neighborhood in Santa Barbara. It's landscaped with water-loving ornamentals, some drought-resistant plants, a 3/4-acre lawn, and a vegetable garden. During the drought, the spread annually soaked up 500,000 gallons of water. Meaning? To hold a year's worth of irrigation, a cistern for the Santa Barbara estate would need to measure 50 feet on each side by 27-feet high! Suffice it to say that such a behemoth would cause a severe drought in your cash flow. (More on construction costs later.)

In arid summer climates, most cisterns are used for supplementing your water supply or for providing survival water for small or drought-resistant plantings. Because construction costs usually limit their size, cisterns for complete landscape irrigation are more often appropriate in places which get periodic rains year-round. Throughout the world, cisterns are most commonly found where rains are sporadic but not too erratic.

Anatomy of a Cistern

CISTERNS ARE PRETTY LOW-TECH OPERATIONS. I DIDN'T SAY "no-tech" — selecting, installing, and maintaining a cistern takes a bit of planning. Here's how they work:

All the action begins up on the roof. To get the rain through a gutter and a downspout and into the storage tank, you first have to catch it. Good surfaces for harvesting rain include, in a more-or-less ascending order of plant toxicity: terra-cotta tiles, stucco, painted metal roofing (avoid galvanized metal with its zinc com-



The funnel capping this free-standing cistern collects rain. The plastic tank stores 1,400 gallons.

pounds), untreated wooden shingles (not a good roofing material in the wildfire-prone West), and composite shingles (these must be allowed to flush more thoroughly, due to the petroleum and gravel components). Flat roofs are usually inappropriate for rain harvesting because they're sealed with various tars and petroleum products.

When the heavens open up after an extended dry period, the first water to come pouring down the roof drains is usually full of leaves, conifer needles, soot, bird guano, and a taste of civilization's chemical smorgasbord. When a storm hits, channel the first of the rainwater away from your cistern or rain barrel. The longer the drought, the more thoroughly you'll need to flush the collecting surface.

The device which diverts the first rains is often called a *roofwasher* — it comes in manual or automatic. A manual diverter is usually a pivoting metal flange or a three-way valve. It works much like the damper in a wood-burning stove's chimney pipe. Flipping the handle to one side sends the water into the ground. Flipping it in the opposite direction delivers water into the tank. Automatic roofwashers eschew motors or electricity. Rather, debris-strewn rain washes off the roof and fills a holding chamber which drains slowly. As the water keeps on coming, it bypasses the bloated chamber and flows through a series of filters before emptying into the cistern.

Roofwashers get rid of just the grossest stuff — screening out debris that's larger than, say, 1/8-inch. Sprinklers and especially drip-irrigation systems will quickly clog with particles measuring 1/8-inch. A series of polyester fabric filters, which filter water far better than a wire-mesh screen, can be added when the water is delivered via sprinklers. But even drip irrigation can be served by cisterns if the filters are backed by a typical irrigation



AVERAGE ROOF CAN

CAPTURE A HEFTY

BIT OF WATER, EVEN

IN ARID CLIMATES.

filter. In both cases, a pumped system is required to force the cistern water through the last stage of filtration, just before water reaches your sprinkler.

Even when rainfall is frequent, windstorms blow leaves, sticks, and tree limbs onto the roof. A *debris filter* — most commonly a simple grate or screened cover that fits over a cistern's intake port — has the unglamorous task of keeping all this litter out of your rainwater. One approach eliminates the problem at the gutter. Made of steel mesh, gutter guards keep nesting birds and the like out of your gutters — and their leftovers out of your cistern. The guards are often made with hinges, allowing the screens to swing open for easy cleaning.

As we'll soon see, the average roof can capture a phenomenal amount of water, even in fairly arid climates. Calculating the amount of rainfall that can be

captured is important, but sizing your cistern more often involves determining how much storage you can afford.

Choosing a Cistern

CISTERNs COME IN ALL KINDS OF MATERIALS, AND INSTALLING some of them — such as poured concrete tanks and brick cisterns — require the work of a hired contractor. Others can be built or installed by the average homeowner. Do-it-yourselfers who build their own cistern-systems usually link up a number of salvaged tanks, which are easy to move and save money. Such systems can end up storing an impressive amount of water, even if they look like Rube Goldberg contraptions. Owner-builders can also use plastic tanks which can be placed on compacted bare soil, a packed gravel base, or a poured concrete slab.

The simplest cistern is a rain barrel connected to the end of one or more downspouts. In the past, the barrel was typically a leftover pickle or wine barrel, or a 55-gallon drum with a lid. These days, most gardeners use the rain barrel's spigot to fill a sprinkling can for watering indoor plants. (Modern mail-order catalogs are selling plastic versions of the old-fashioned rain barrel.)

Prices for cistern materials vary widely. The best way to compare expenses is to convert all costs to the price-per-gallon of storage. For example, where I live, north of San Francisco, costs range from \$.40 per gallon for ugly above-ground storage to \$1.00 per gallon for contractor-installed, underground tanks (see "Cistern Costs" p. 46.)

As you can see, the larger the tank, the lower the cost-per-gallon. Smaller tanks are eas-

Made of ferrocement, most of this 1,500 gallon cistern sits below ground.



Cistern Costs in San Francisco Bay Area

Type of Cistern	Size, in Gallons	Cost per Gallon*
Liquid storage bags from a mail-order company	800	\$.63
Plywood and plastic liner mail-order cistern kit	500	\$.50
Plastic downspout barrel	42	\$.72
Poured-in-place concrete tanks	10,000	\$.50 to \$.60
Plastic, polyethylene, & fiberglass tanks	50 to 4,000	\$.40 to \$.78

*These prices usually do not include fittings, valves, pipes, or plumber's bills. Building a foundation, or pad, sometimes requires an additional fee.

ier for the do-it-yourselfer to work with, but this convenience comes with a slightly larger price tag. Innovations in plastic and fiberglass tanks have made them competitive with concrete tanks — which can settle or crack. Spending a little more for a plastic tank, which can be set on compacted, level ground without the expense of building a concrete slab or gravel base, will increase savings over the long run.

Systems which rely on gravity to deliver water to the garden usually have the tank above ground to build up pressure. Because most storage tanks are bulky and ugly, many people would rather bury them. One advantage to pumped cisterns is that they can go below ground. But the cost of an underground tank can be quite high because it must be engineered to withstand the weight of compressed soil around its walls. Plastic or fiberglass tanks which can be buried cost \$1.00 per gallon or more.

There are several things to keep in mind when choosing a cistern: When considering a *large tank*, make sure it has a lid or hatch that's big enough for you to climb inside for cleaning and repairs. *Above-ground tanks* should have screen-covered air holes to help keep the water fresh and bug free. *Every tank* must have a bottom drain consisting of a large-diameter pipe for flushing accumulated sediment.

With a delivery system powered by gravity, all you need is a hose to reach the plants downhill from the tank. To keep the hose from sucking too much sediment off the tank's bottom, make sure the discharge pipe is placed at least six inches above the base. The pipe, capped with a standard hose bib, should project through the tank's side.

Pumped systems require an electrical centrifugal or sump pump. Keep in mind

that sump pumps can't build up much pressure. A \$100 to \$200 sump often won't create more than 15 pounds per square inch. Such pressure can power a limited drip-irrigation system, but won't do much for most sprinklers (except for a few of the more modern, low-flow mini-sprinklers). Be sure to check the specs on the sump pump's packaging to ensure that it can pull water out of the tank or pump it far enough uphill to meet your needs. This lifting capacity is called the "head," and is measured, in feet, as the "vertical height."

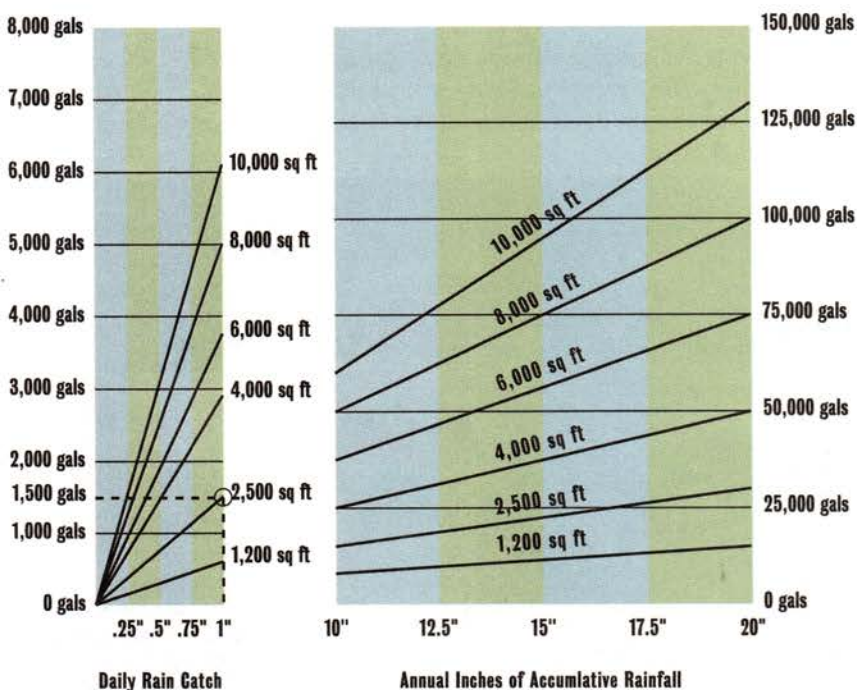
Centrifugal pumps are more expensive than sump pumps, but they build up more pressure and deliver a greater volume of water. The pump is best mounted on the outside of the storage tank, level with its base. As with

sump pumps, water should be pulled through a discharge pipe that's several inches above the bottom of the tank.

Up on the Roof

EVEN A MODEST ROOF CAN CAPTURE AN AMAZING AMOUNT OF rainfall. For example, consider a mid-size, 2,500-square-foot roof. Use the chart "Estimating Rainfall Runoff — Daily Rain Catch" (below, left) to figure the amount of captured water per inch of rain. Along the lower axis of the chart, locate the one-inch figure for a day's rainfall. Trace this line up to the 2,500-square foot figure. Now trace a line to the x-axis from the

Estimating Rainfall Runoff



Source: *Free Water for a Thirsty World* by L.L. Williams

intersection of the rainfall and square footage figures. In this example, one inch of rain falling onto a 2,500-square-foot roof results in about 1,500 gallons of runoff. (For estimating yearly rainfall runoff, check out the chart on the right.)

During the past six years of drought, a winter's rainfall at my house has been 35 to 45 inches, compared with an average precipitation closer to 60 inches. If I could afford the storage, I'd be able to save 21,000 to 27,000 gallons during a drought and up to 36,000 gallons in an "average" year! An even easier method for determining rainfall runoff is to multiply the roof's square footage by 0.6 to get the number of gallons of water your roof will collect for each inch of rain.

You may assume that your cistern should be sized to accommodate the maximum rainfall your roof can capture — not necessarily. There are two more practical approaches to determining size.

First, you can size the cistern to store all the water you'll need to get through each dry spell. (If you live in the arid West, where the seasonal drought always lasts five to six months, money had better not be a limiting factor.) To do this, find out the average length of the dry spells in your area. Talk to the weather reporter at your local newspaper or television station, consult the weather records at the closest fire or forestry station, or contact the Master Gardener program through your Cooperative Extension.

Next, estimate your landscape's irrigation needs. From past water bills, calculate the total water usage for the irrigation season. (Many bills present water use in HCFs, or hundreds of cubic feet; each HCF equals 748 gallons.) Now calculate how much of your total water use goes to the garden. In temperate climates with summer humidity, exterior plant use may account for just 30 percent to 50 percent of total water use. In the dry, hot summers of the West, the landscape may use 50 percent to 70 percent of the total. Check with your local water department for the average percentage for your climate. (Ask for the department's water conservation staffer.)

As mentioned earlier, some landscapes were designed without water conservation in mind; and some gardens are so extensive that a cistern large enough to irrigate the entire landscape is out of the question. So the second, more conserving approach to sizing your cistern is simply to install the largest one you can reasonably afford. Then replace plants with more water-thrifty types, decrease the area of your lawn, convert sprinklers to drip irrigation, use a broom to clean your patio instead of hosing it off, and transfer all container-bound plants into the ground.

During extended dry spells or when the leaves fall in autumn, it's a good idea to clean your roof periodically. It's pretty easy to scrub metal roofs with a biodegradable detergent. (Avoid dumping chemical-based cleansers into the cistern; be sure to divert the next rainfall from the cistern until the water runs clean and clear.) Also, cut back the limbs of surrounding trees to reduce the amount of tree litter that falls on the roof. This is especially important if your gutters aren't topped with wire screens.

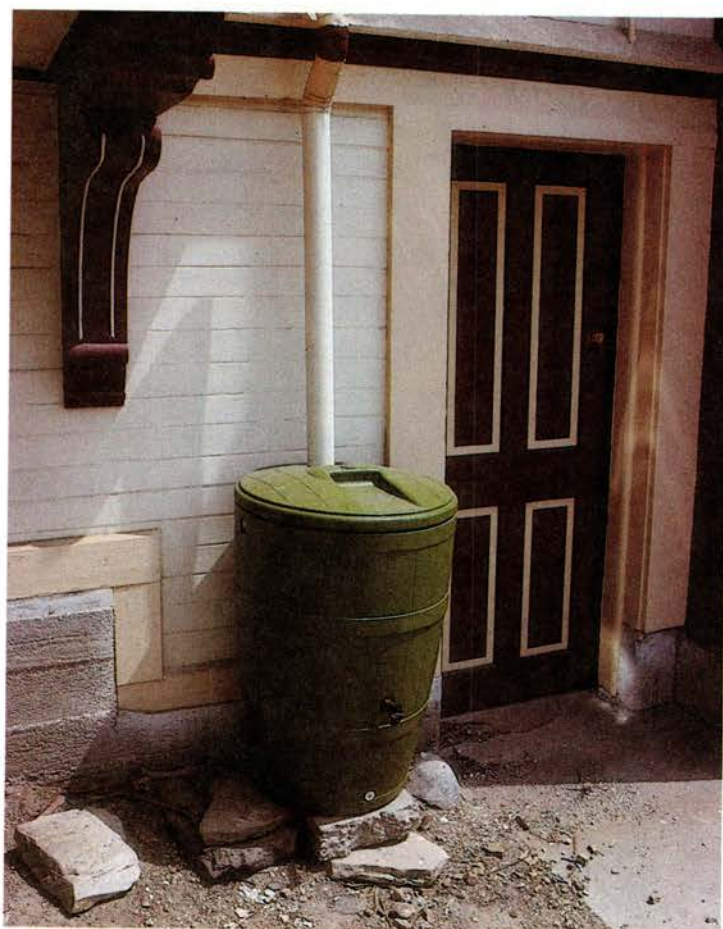
Ideally, the cistern should be placed underground

or in a cool, shady spot where algae and scum won't form. If these moisture- and warmth-loving growths appear, you can often control them with a change in the water's pH. (Check with your local nursery or pool supply store.)

Over time, masonry cisterns may develop cracks and leaks due to settling. With a hatch large enough to allow you to enter the cistern, these can be fixed easily. After draining the cistern and letting it dry, work cement or stucco patching compound into the cracks. Be sure to use a patch material, such as Thoroseal, that's rated safe for potable water. Some special patch materials, like Waterplug by the Thoro System, are mixed into a paste and, after being pressed into the cracks, will expand as they cure. If the cistern can't be drained, other pastes (including Waterplug) can be applied underwater.

Like any technology, even cisterns have their unwanted side effects. While your cistern captures rainfall and diverts it to your garden, it's also taking it away from the surrounding landscape. Sure, even a large cistern's entire holdings won't amount to a drop in the bucket compared to the volume of rainfall from a single storm. But if enough people in a given watershed were to store vast amounts of rainfall, they might have a negative impact on local fisheries, vernal pool ecosystems, bird habitat, groundwater, or even ponds.

So here's a golden rule: Water conservation in the garden should go hand-in-hand with any cistern. Even though a cistern gives you a measure of water independence, there's no justification for squandering what is still a precious resource.



A typical mail order, plastic rain barrel. The spigot's location means that the bottom one-third of water can't drain.

Phillips Petroleum has offshore oil drilling platforms you could eat off of. But what question does that answer?

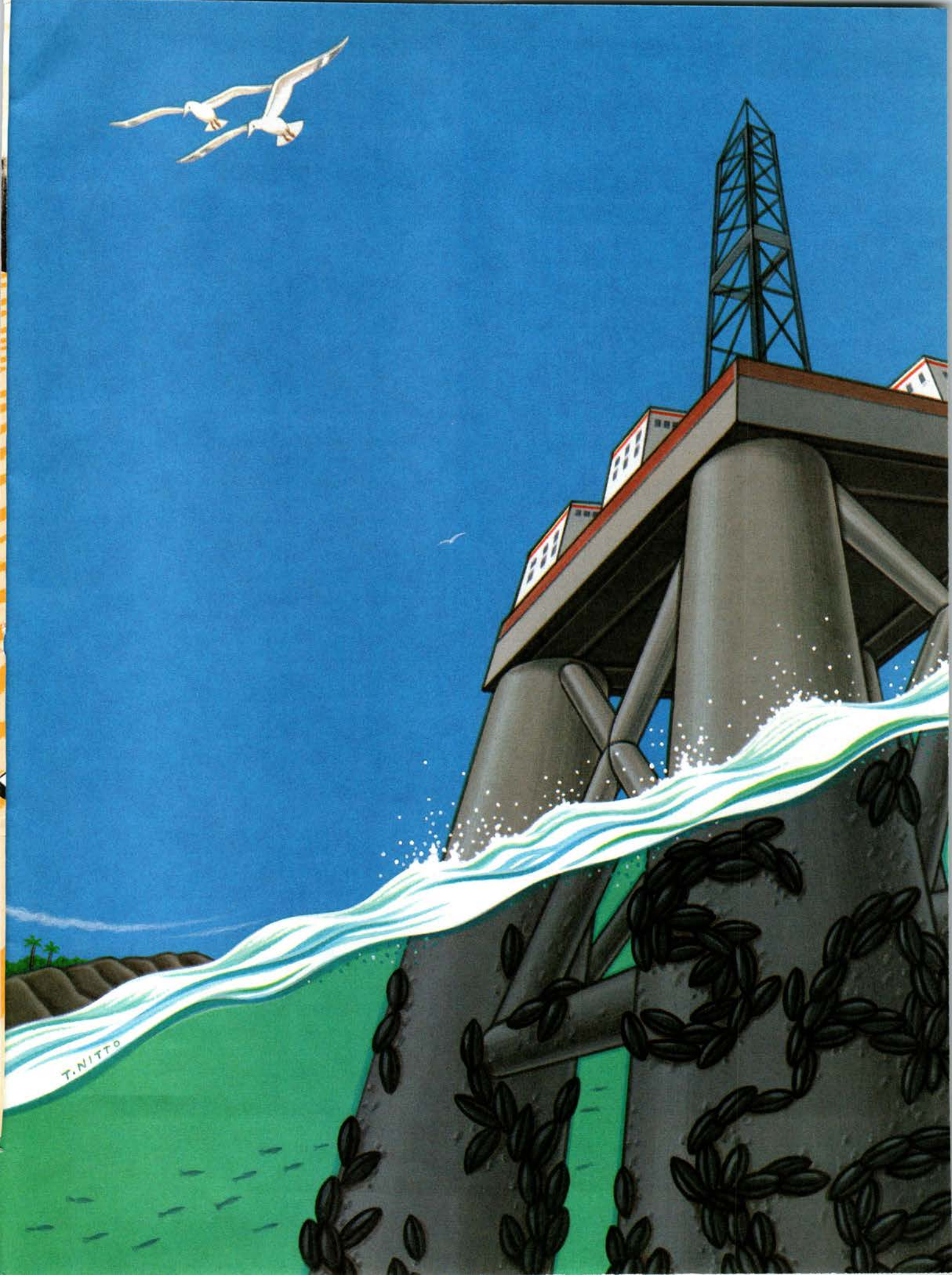
By Art Kleiner ~ *Illustration by Tomio Nitto*

FLEXING THEIR MUSSELS

IT HAS BEEN SAID THAT CORPORATIONS CREATE THEIR OWN OPPOSITION. FOR PROOF, LOOK NO FURTHER THAN the continental shelf off California, especially the part known as the Santa Barbara channel. There, in 1969, from beneath a Union Oil Company drilling platform, 5,000 barrels of oil burst through under-sea fissures one day. Union Oil had petitioned for an exemption to drilling regulations, the world later learned, allowing it to install a shorter-than-standard concrete casing inside the well's hole. It also came out that geologists had known about the channel's frequent earthquakes, which made it vulnerable to seepage. The eruption left behind an 800-square-mile oil slick, 30 miles of sludgy beaches, some memorable photographs of oil-soaked gulls, two years of lawsuits and investigations, stricter petroleum regulations... and a permanently foul reputation for offshore drilling.

Ronald Reagan's home city is still fiercely divided over offshore drilling, even 20 years later. Last September, 2,000 people stormed a Santa Barbara hearing to protest new federal offshore lease permits in the nearby Point Arguello oil field. Led by a group called Get Oil Out (GOO), which traces its origins to the 1969 spill, the protesters invoked a long-familiar philosophical question: Can large-scale technology ever be guaranteed trustworthy? You can see the offshore platforms from the beach: ocean-stained bunkhouses pitched like otherworldly metal tents on squat latticework frames, immense enough for boats to congregate beneath. How could such technology ever be brought to human scale? Can we learn to judge its safety?

A human-scale answer is proffered in a luscious two-page advertisement, placed by the Phillips Petroleum Company several months ago in such magazines as *The New Yorker* and *Business Week*. The ad shows a plate of mussels in cream sauce, garnished with scallions and zucchini; it is so appetizing that people have written Phillips for the recipe. "Divers who search for the world's finest seafood," announces the copy, "harvested these mussels from a rather remarkable place" — the supporting pillars of the drilling rig. In other words, "Mussels, oysters and fish thrive in an ecosystem created



by our oil and gas platforms."

The ad goes on to explain how Phillips captures every drop of fluid, rain, or seawater that falls on the platform, and pumps it onshore for filtering. If you write to the address given, Phillips sends a four-color brochure rich in technical detail about their operations, albeit couched in glib phrasing about restaurant-goers "lifting their glasses" to Phillips' concern for marine life.

In the booklet you'll also find a photo of Bob Meek — ruddy, mustachioed, and grinning from under his diving goggles. Meek, who is 45, does not work for Phillips. He is a marine biologist, and an independent businessman with his own company called EcoMar. Meek first dreamed up the idea of harvesting mussels from oil platforms back in 1973. Shell had hired him to study a problem that affected all the rigs in the channel. So many barnacles and mussels grew on the supports that their sheer mass blocked the waves, enough to threaten the platforms' stability. The drillers had always blasted the mussels with undersea pumps; Meek realized he could sell them to restaurants instead.

But the oil companies all turned down his idea, repeatedly — until 1980, when Meek walked in to a Phillips meeting and said, "I hear you've just written a check for \$100,000 to a hydro-blasting company. I could remove those mussels for free." It was the kind of win-win situation that has been the hallmark of modern corporate environmentalism — a situation where everyone profits and ecological damage is at least mitigated.

Among major oil companies, Phillips has always been considered a gritty little maverick. Its headquarters town — Bartlesville, Oklahoma — is 40 miles from the nearest Interstate; its management was virtually self-contained until the mid-1970s, when they pled guilty to breaking federal tax and campaign contribution laws. That prompted a stockholder suit, whose settlement forced the Phillips board of directors to open up and accept new members. Today, as a result, Phillips is one of the most socially progressive oil companies; the first, for instance, to have women on the board. They were also the first to strike oil in the North Sea, off Norway in 1969, and their fortune has been tied to offshore drilling ever since.

Phillips was first among oil companies to publicly endorse wilderness protection. An ad campaign going back to the early 1970s showed forests around their drilling site in the Wasatch National Forest (Utah), and prodded viewers: "Can you find the oil well here?" The roads they'd built to the wells, they claimed, actually helped the forest; hunters drove on them instead of through the underbrush. Preservation activists would disagree (on grounds that no one should drive there at all), but this is typical of Phillips's modus operandi: They enter a contro-

Divers who search for the world's finest seafood harvested these mussels from a rather remarkable place. Just below the ocean surface, beneath the offshore platforms of Phillips Petroleum Company.

Mussels, oysters and fish thrive in an ecosystem created by our oil and gas platforms.

We'd like to think that says we're doing a few things right. That our ongoing efforts are working, protecting the environment in which we work.

Efforts like rigorous daily safety checks and pumping all fluids—even rainwater—off the rig, onshore, for processing to EPA standards.

For seafood devotees, these are efforts that produce clean, succulent shellfish.

For us, they are day-to-day investments that pay off in a positive relationship with the environment for the long term.

PHILLIPS PETROLEUM COMPANY



versial site, handle it with some responsibility, and then maintain that they created a net ecological improvement. In retrospect, it was surprising that they ignored Bob Meek for so long.

ECOMAR, USING RAKES AND UNDERSEA VACUUMS, BEGAN gathering mussels in 1980, first for Phillips, then for other oil companies as well. For years, to convince California's health board to let restaurants serve the mussels, Meek tested them weekly for bacteria, heavy metals, and hydrocarbons. He found none of the above. Today, if you eat mussels in a San Francisco restaurant, chances are they came from an oil platform. Meek believes that offshore oil platforms are ecologically safe. "If there was a contaminant in the water," he told me, "the mussels would pick it up."

An extensive ecological literature exists, in fact, on shellfish as water pollution indicators. That's how we know (from mussels in Normandy) about the dangers of cleaning oil spills with detergent. Offshore wells are not inherently safe, but in Santa Barbara, they are well-managed enough to be secure. Even building new wells, apparently, presents no increased pollution danger: Meek has harvested edible mussels from wells as they were being drilled. The thick "muds" used for lubricating the drills no longer contain the heavy metal compounds which poisoned marine life in 1969, and the dirt from the drilling can be returned through pipes to the ocean floor.

In short, the mussels ad is credible — more so than seals applauding double-hulled tankers on camera for Du Pont. Meek argues that new offshore drilling leases should be granted soon, because the big, reliable companies will otherwise lose interest, and the leases will go instead to smaller companies with shallower pockets and less quality control. For other reasons, however, leases may be unnecessary. The mussels may be red herrings. That ad campaign, focusing on whether the platforms are clean enough to eat off, distracts us from the deeper question: Do oil companies need to drill new wells at all, with or

The eagle has landed.

In Oklahoma and Mississippi, Georgia and Alabama. Where few bald eagle nests have produced young in the last 50 years. Using precious eggs and dedicated effort, the Sutton Avian Research Center is successfully raising eagles from fuzzy to fierce. And releasing them into the skies bald eagles once called home.

Phillips Petroleum supports this unique program to re-establish our endangered national symbol.



After all, if Man can land an Eagle on the moon, he can surely keep them landing on the earth.

Phillips' ad campaign, focusing on whether oil platforms are clean enough to eat off, distracts us from the deeper question: Do oil companies need to drill new wells at all, with or without environmental opposition?

without environmental opposition?

SO FAR, ACCORDING TO THE CALIFORNIA COASTAL OPERATOR'S Group (their local lobby), oil companies have invested more than \$10 billion in Santa Barbara offshore leases. About one-third of the firms are walking away from that investment; one-third are tenaciously fighting to keep their leases active; and another third (including Phillips) appear to be mulling it over. Twice, Phillips has devalued the assets of its Point Arguello interests (a costly move on a balance sheet), citing the delay from environmentalist opposition as the reason. But could they be writing it off because there is little intention left to develop it? The best reasons for staying in are political. No oil company executive wants to be remembered as the one who walked away from the last big strike in the lower 48 states. Indeed, the most eager participant in these intrigues seems to be the federal

government, which collects the lease money. With lower-quality Santa Barbara oil selling for half the price of Texas crude, the oil companies seem motivated only half-heartedly in California.

Now consider the reasons *against* staying. Santa Barbara oil is heavier than its

But now, pressure is coming from a new source. Petroleum emissions are indisputably linked to global climate change, and diplomats around the world have begun to mandate less-polluting alternatives to oil — natural gas, methanol, ethanol, electric cars, and liquid petroleum gas. Global demand for oil is almost predetermined to shrink — with or without any change of energy policy from our recalcitrant federal government. If that happens, rather than a shortage, we would face a glut of unwanted crude.

MOST TOP OIL COMPANY EXECUTIVES ARE NOT READY for this. They learned the business in the steadily growing 1960s. It's not just environmental politics, but also the manically rising and falling oil prices of the past 20 years, that has them frustrated and anxious. What if a new Middle East war breaks out? What if supply collapses? What if demand does? What if they don't get to drill in the Arctic Natural Wildlife Refuge? What if they *do*?

Since Valdez, every oil company — including Phillips — has conscientiously strived to reduce accidents and environmental misdeeds. But Amory Lovins, and other credible gadflies, are insisting that oil companies should go much further: They should reshape their businesses. Just as electric utilities like Pacific Gas & Electric now find it cheaper to subsidize energy-efficient appliances and "negawatts" than to build new power plants, Lovins says that Phillips, Chevron, and Mobil would all make more money selling "negabarrels" than actual oil. In other words, oil companies should become benevolent financiers, investing in research into higher mile-per-gallon engines, for instance, and reaping both the resulting profits and the savings from not building more offshore platforms. Or, if they resist Lovins' tiptoe out of the oil business, they could at least embrace the re-refining of used motor oil (which is now a cottage industry, held back by the low oil price). They could put more effort into alternative fuels (efforts so far have been visible, but grudging). Or they could simply promote natural gas, which is undervalued now on the world market, but which is much cleaner than petroleum as a potential motor fuel.

Lovins is confident that oil companies will eventually adopt such ideas. He quotes two Royal Dutch/Shell executives, who recently told him, "Thank God for energy efficiency. It slowed down the depletion of our reserves enough to give us several extra decades to get out of the oil business gracefully. Otherwise, we would have had to get out by roughly the year 2000."

But most of the oil industry is not known for giving in as gracefully, and it's hard to share Lovins' optimism. Yes, the muskels are quite palatable. One has to wonder, though, what that has to do with the future of offshore drilling.

Too pretty to get its feet wet.

Shaving by shaving, feather by feather, a wood block takes on life. The shaping of decoys has been a skill in Louisiana for as long as Cajun has been spoken. But this beauty will never flirt with a duck. Her charms are saved for the artistic, the art collector, for all the admirers of things carved by hand. We at Phillips Petroleum are captivated, too. We try to take as much care when the work we do touches the habitats of wildfowl, as these artists take with their birds. To every last feather.



Saudi equivalent; it yields less of the highly demanded lightweight gasoline per barrel, and more of such lower-valued "sludge" products as asphalt. Competing oil fields in other countries are poised to expand, including potential fields in the Soviet Union.

Plus there's what energy-efficiency pioneer Amory Lovins calls the "five-million-barrel-a-day oil field under Detroit" (i.e., fuel efficiency savings). In the 1970s, the bitter medicine of the energy crisis turned out to be good for the U.S.; our auto fleet fuel efficiency improved by 4.6% each year. This meant not just cleaner air, but a serious economic boost, since we did not have to pay for all that gasoline. Since 1985, when OPEC lost its political clout and the oil price fell, our energy efficiency improvement ceased. It did not revive during the Gulf War.

KEEPERS

PRODUCTS • ALTERNATIVES • RESOURCES

Common Folks' Coffee Filter

BY NOW, WE'VE ALL HEARD ABOUT THE EVIL DIOXIN MOLECULES THAT CAN SCAMPER OUT of a bleached-paper coffee filter and plunge into your java. This sinister little side-effect of chlorine bleaching isn't the only problem with paper filters — they're a classic one-shot deal: use once, throw out.

The permanent gold-screen filters are certainly one answer to both problems, but the initial purchase price is steep (they're around \$25). So, for the common folk, there's the Coffee Sock.

The Coffee Sock is a simple cotton cone. Made by an Oregon cottage industry that's now going national, it comes in all cone sizes, as well as a basket version. The colored edge folds over the lip of your plastic coffee funnel, holding it in place. When the coffee's done, you invert the sock to dump the grounds, then rinse it in warm water. (Confession: I don't take mine off the funnel every time — just dump and rinse. Hey, any bacterium that likes coffee is a friend of mine.) One sock lasts three to four months.

Packaging is a bio-degradable cellulose bag, and a glossy paper label with 50 percent recycled content (mostly pre-consumer). Two for \$7.95, specify cone size #2, #4, #6, or basket. The Coffee Sock Co., Dept. GM, P.O. Box 10023, Eugene, OR 97440.



Toothsome Paste for Kids

WHILE MOST GROWN-UPS I KNOW consider Tom's of Maine toothpaste a gourmet treat, I can understand why kids would balk at it: There are no spangles, no cartoon characters, no stripes, and worst of all, no sugar or saccharine. In other words, ptoey.

So Tom's has risen to the challenge.

The new children's

toothpastes have the usual low-tech ingredients you'll find in the adult versions, but instead of baking soda or fennel flavoring, the children's versions are spiked with orange, banana, pineapple, and strawberry extracts, for a lightly sweet, fruity flavor. Perhaps more importantly, they sport bright, goofy tubes with animal characters, and colorful boxes — on which Tom

and Kate Chappell's nine-year-old son Luke asks kids to write to him about animals and recycling.

The toothpastes are fluoridated, so forestall your young fruitcakes from swallowing the stuff. In the Tom's tradition, the tube is recyclable aluminum, and the box is recycled from 50 percent post-consumer, 50 percent pre-consumer waste. If you can't find them in grocery, health-food, or drug stores, call Tom's at (207) 985-4961.



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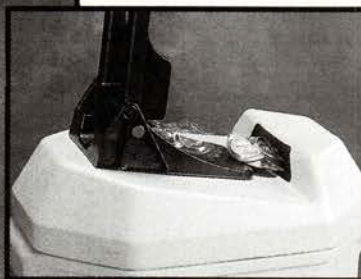
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Grilling in Good Conscience

Tis the season for searing steak, grilling grouper, and torching tofu. Fire up the barbecue and let's have some of that blackened food that tastes so good you can't believe it's rotten for you. But before you squirt lighter fluid all over the place, consider this: Lighter fluid is such a heavy contributor to smog that it's banned in Southern California. It's not just the burst of flame that's so polluting — it's also all the fluid that evaporates as you wait for it to sink into the charcoal. Nationally, an estimated 14,500 tons of volatile organic compounds are released from the evaporation and burning of lighter fluid each year. These petroleum compounds react with sunlight to produce smog.

If you don't want to blow big lettuce on a gas grille, try a low-tech chimney to get your charcoal smoking. A chimney looks like a section of stove pipe with a handle. You scrunch a piece of newspaper in the bottom, and the draft from the burning paper draws flames up through the charcoal above. When the coals are smoldering (in about half the time of lighter fluid), just dump them into the grill.

Chimneys are a hot item. They're available in many hardware and home stores for \$9 to \$20. If you can't locate one, and don't want to use a plain old coffee can, mail-order from Earth Tools, Dept. GM, 9754 Johanna Place, Shadow Hills, CA 91040; (800) 825-6460. Product #2-500, \$15 ppd.



RESOURCES

Adbusters Quarterly:

A Magazine of Media and Environmental Strategies

PUBLISHED BY THE MEDIA FOUNDATION,
1243 WEST 7TH AVE., VANCOUVER,
BRITISH COLUMBIA, V6H 1B7, CANADA.
FOUR ISSUES, SPACED HAPHAZARDLY OVER
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"YESTERDAY I FOUND ADBUSTERS; TODAY the TV is in the basement, and my subscription is in the mail." That's from a letter to the editor of this spunky, funky magazine.

Adbusters isn't just about individual

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In the Fall/Winter 1991 issue there are articles on spiritual famine, forestry, animals in advertising, and a how-to story on getting "guerilla ads" on your local TV station — and that's just the beginning. There are 82 jam-packed, ad-free pages in all. It's witty, insightful, and impolite: A spoof of an Absolut Vodka ad ("Absolut Nonsense") drew a legal



challenge that was eventually dropped.

So fear not that with the TV in the basement, your general-foolishness needs will go unmet: The spoofs are hilarious, and the editorials are vastly enlightening.

E for Environment

BY PATTI K. SINCLAIR. 306 PAGES.

R.R. BOWKER, P.O. BOX 31, NEW PROVIDENCE,
NJ 07974; (800) 521-8110. HARDCOVER,
\$44.70 PPD.

Bargain Alert!

Ms. Sinclair has put together an annotated bibliography that covers children's environmental books — 517 of them. The titles, aimed at kids aged preschool to 14, are organized under 29 sections, including "Enjoying Nature with Family and Friends," "Deserts," "Forests," "Endangered Species," "Garbage and Recycling," "Population and Food Supply," and "People Make a Difference." Fiction and nonfiction are included, as well as the age level each book is written for, followed by about 175 words describing the book. There are author, title, and subject indexes for quick reference.



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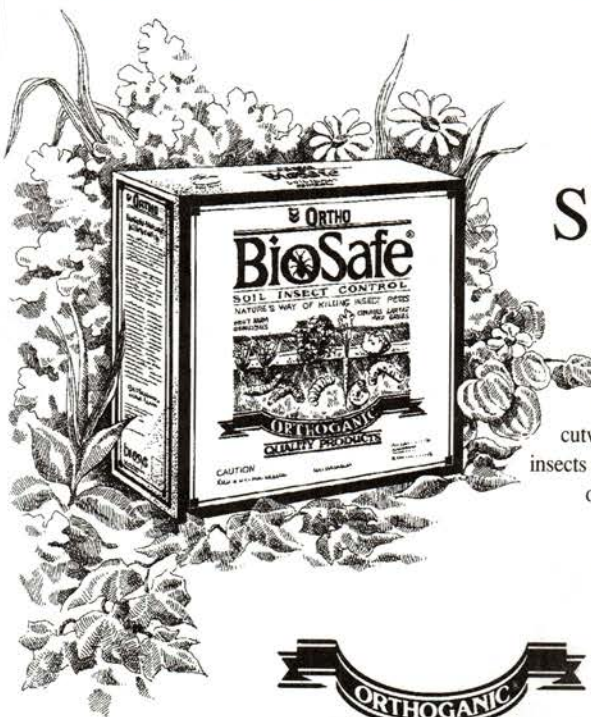


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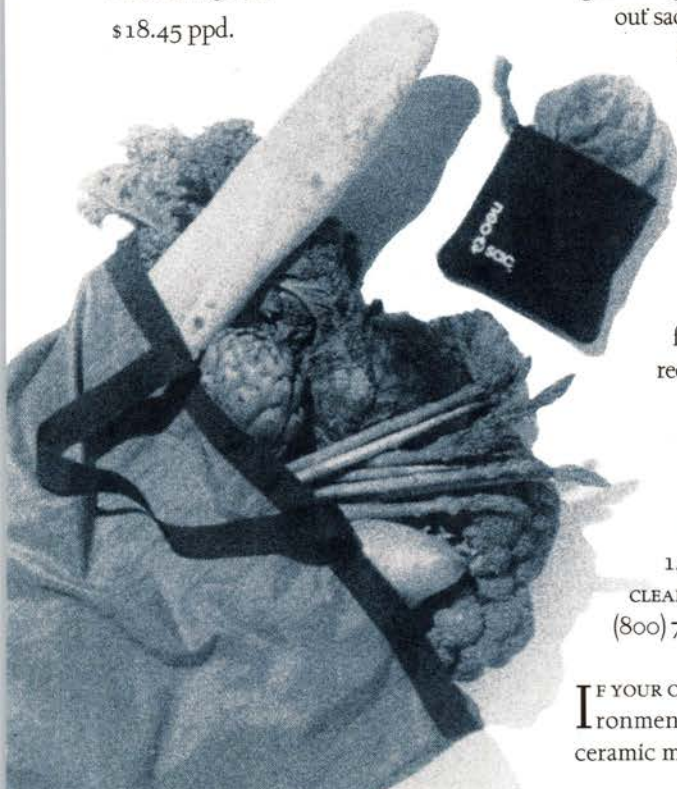
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Recycled Papers; The Essential Guide

BY CLAUDIA THOMPSON. 162 PAGES.
MIT PRESS, MASSACHUSETTS INSTITUTE OF
TECHNOLOGY, CAMBRIDGE, MA 02142. \$25.

THE ESSENTIAL SHORT STORIES OF ALL TIME. The Essential Freud. Books claiming to be "the essential" always catch my eye: Why should we waste our time with anything else? In its own way, *Recycled Papers; The Essential Guide*, lives up to the promise of its subtitle: It tells you everything you want to know, and only that, in a graceful, straightforward way.

Ms. Thompson stresses technology, markets, the physical characteristics of paper — the real kishkes (guts) of the paper world. And she avoids the jargony drone that many writers assume for technical subjects; she manages to keep the reader moving along without sacrificing detail. Chapters on the history of papermaking and how recycled papers are made help make clear why sorting and avoiding contaminants at collection are so important. Recycled-paper buyers will find the info they need here, too. Even the appendices are helpful. Essential reading, indeed, for those to whom recycling and recycled paper are essential.

— Ethan Seidman

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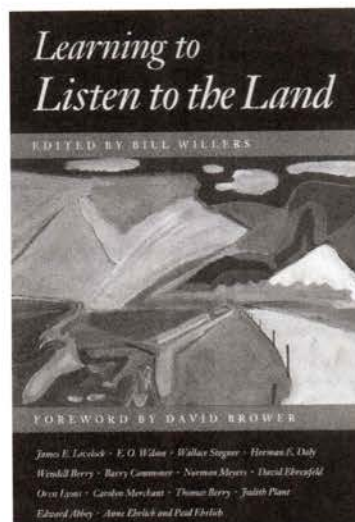
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Learning to Listen to the Land

EDITED BY BILL WILLERS. 280 PAGES.
ISLAND PRESS, P.O. BOX 7,
COVELO, CA 95428;
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COVER, \$18.95 PPD.



IF YOU'VE SEEN THE TERM "DEEP ECOLOGY" and cringed, try dipping your toes into this collection of clear, brief essays and excerpts. The writings of such artisans as James Lovelock, Wendell Berry, Edward Abbey, and the Ehrlichs are divided into three sections.

In "Nature and Biodiversity," you'll be introduced to the various arguments for keeping a maximum number of species on the planet, none of which, it turns out, really holds water except, "They deserve to exist." (My favorite line out of 120 pages of brilliant arguments for biodiversity for its own sake: "Faint-hearted ecologists who fear that their favorite species are damned-well useless will just have to risk it.")

In "The Impossibility of Endless Growth," you'll get a crash course in the collision between our economic system and our ecosystem. "Toward Holism and Sustainability" is the light at the end of the tunnel, where grassroots groups, fired-up individuals, and a new spirituality hold out hope for the future.

— Reviews by Hannah Holmes



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Car Sick in Santa Fe

WHEN I GOT A 1992 TOYOTA FORERUNNER RECENTLY, driving it made me very ill. The dealer finally took it back. How on Earth can a new car make you so sick?

KETURA ESCHEL
Sante Fe, N.M.

Meanwhile, if you do have to drive the car, keep the windows down and the air-conditioning fan on. Persistent fumes may take months to fade away. If after all these actions you're still carsick, your only recourse may be to buy a stripped-down van and install your own non-allergenic seats and coverings.

STICKER SHOCK? NO, I WON'T MAKE LIGHT OF your problem: The severe headache and nausea, as well as the prickly skin, watery eyes, sneezing, and, finally, liver pain that you complained of may have come from in-car air pollution, similar to indoor air pollution. You've been struck by a malady that car manufacturers do not consider a problem, according to a spokesman at Toyota, who explained that since the federal government has no health regulations on it, your illness doesn't exist.

According to natural products advocates such as Debra Lynn Dadd, author of *The Nontoxic Home & Office*, petrochemical adhesives that leach toluene and other toxic aromatic hydrocarbons are all over the vehicle, holding the carpet and seat covers together and attaching them to the car body. Foam or plastic that's been inflated with chemical blowing agents, such as HCFCs, is in the seats and dashboard; the vinyl covering for both can fume traces of hydrochloric acid when warm. Then there's all that oil-based enamel paint and primer coating metal body parts.

A newly published environmental consumer book, *The Green Pages*, notes that for icing on this petrochemical layer cake on wheels, manufacturers spritz the car's non-fabric interior with plasticizers to help keep synthetic surfaces supple. Since the plasticizers are topical, rather than integral, they're the most likely to fume. To see these fumes up close, as well as dispel at least some of them, perform a "bake out"

("Garbage Dictionary," May/June '90).

To bake out a new car, use the car's heater to get the interior air as hot as possible. Turn it off and park the car in direct sunlight, close the windows up tight, and get out. The heat encourages chemical components such as volatile organic compounds (VOCs) to evaporate. In a few hours a greasy, whitish film will usually build up inside the windows, consisting mostly of plasticizers; VOCs by and large are colorless. After a thorough venting, wash the car's interior surfaces, preferably with a cleaner based on citrus solvents such as CitraSolv, and rinse with clear water. Repeat the process until the film goes away.

(Gas) Tanked on Vodka

Can my cars run on ethanol and where can I buy it for my car? Will modifications be needed?

DALE AZAREN
Willingboro, N.J.

THE GOOD NEWS IS, IF YOU'RE OUT OF GAS, LET your tank chug a gallon of vodka (a very refined grade of pure ethanol) and watch the car go. The bad news is, ethanol is corrosive stuff, and should you keep this up, you'd be broke from liquor and repair bills.

Metal for ethanol fuel lines and gasoline injection systems must be stainless-steel quality — not standard in most cars. Rub-



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ber gaskets must also be upgraded. More bad news (since you're from Jersey): ethanol, and the cars to run on it, are available only west of the Mississippi. In California, Chrysler, Ford, General Motors, and Volvo are selling or plan to sell "flexible fuel" vehicles designed to run on gasoline, bio-fuels (like ethanol and methanol), or blends of the two.

Now for some semi-good news. This November, carbon monoxide, smog, ozone, and particulate standards of the Clean Air Act go into effect. Vehicles in cities or counties not meeting these EPA standards will have to comply with a number of regulations. Your county, Burlington, passes EPA muster, but nearby Camden County and metropolitan Philadelphia do not. One mandate will be the use of oxygenated fuels such as gasohol, which contains ten percent ethanol, so you'll soon be able to fill up with gasohol in those places.

Biofuels like ethanol are distilled from plant matter, which on a molecular level is considered a carbohydrate — a compound of oxygen as well as hydrogen and carbon — unlike petroleum, which is purely a hydrocarbon. That bit of oxygen in biofuel enables it to burn cleaner. Formerly found mostly in corn-growing states of the Midwest, gasohol can work in vehicles without modifications. A pre-1978 clunker or a badly maintained modern car may burn biofuel blends poorly unless re-tuned.

Most cities not meeting EPA air standards must also mandate that cars pass emission tests. When Brazil rapidly switched from fueling cars with gasoline to a blend of 20 percent ethanol and 80 percent gasoline, particulate pollution proved to be a problem until everyone got in tune.

Softening Scum

Are there any non-toxic substitutes to get rid of hard-to-remove scum on ceramic bathroom tiles?

SHELLEY NATHAN-MAY
Houston, Texas

BATHROOM "SCUM" COMES FROM MINERALS, iron, and salts of calcium and magnesium reacting with fatty acids in soap to form that insoluble pasty coating on your tile. If you took a shower with synthetic laundry detergent, this wouldn't be a problem. Borax and sodium carbonate, two traditional laun-

dry supplements, reduce the ability of scum to form. But you're using vegetable-oil based soaps — better for your skin, but they contain the fatty acids.

If your water were softened, however, you could keep your soap (and use less of it, too — up to 80 percent less). Besides contributing to scum formation, minerals get in the way of water mixing with soap, making it harder to lather and to fully rinse the soapy water off your skin and out of your clothes and hair. Scaly calcium and magnesium deposits also build up on the insides of plumbing, particularly the water heater and supply lines, reducing water flow, heat efficiency, and equipment life span.

Looking much like a conventional water heater, a water softener treats water for the whole house and is located somewhere along the building's water main; it usually takes a plumber to do the installation. (A water softener uses porous beads of zeolite clay or synthetic resin impregnated with sodium ions. As the calcium and magnesium ions in the "hard water" come in contact with the sodium ions in the resin, they switch places. Once the beads are full of calcium and magnesium, they're flushed with salt water, which goes down the sewer.)

A unit runs from \$400 to \$800 and is efficiency rated. For water softeners, look under "water filtration" or "water treatment" in the business pages, or try the Sears water line at (800) 426-9345. Hardness in water is rated in grains per gallon; three grains per gallon is considered hard. You must know your water's hardness level before buying a softener.

Attacking already existing scum takes a two-pronged approach: brute force and chemical coercion. Blend enough lemon juice or ten percent-acidity vinegar with baking soda or borax to make a paste. Apply elbow grease and scrub. For extra cleaning punch, try using half a lemon as a sponge. If you're into homemade cleansers try a non-abrasive scouring powder like Bon Ami; Ecover has a no-scratch cream cleaner that's easier to use on vertical surfaces.

Any Questions

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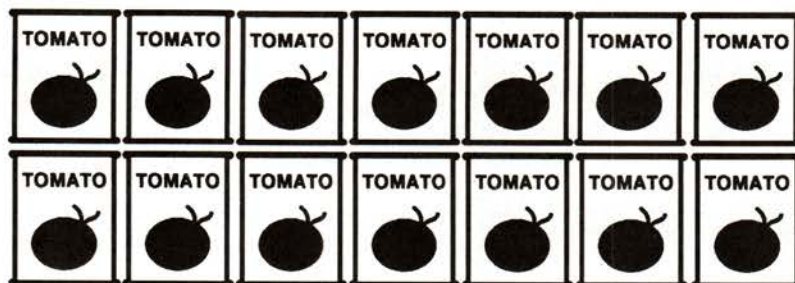
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Campaign '92 = E^{Screwed}

WATCHING THE PRESIDENTIAL CAMPAIGN FROM the sidelines, I've decided to put the whole damn thing In the Dumpster. That this election's E word is "economy" is a given. But the environment hasn't merely taken a back seat. It's not even along for the ride! ¶ Yes, I heard the bits of green blather on

Earth Day, as predictable as green beer on St. Paddy's Day — almost as heady, and no more significant. Since then, Earth Summit aside, almost nothing. Politicians may never provide environmental leadership. But doesn't environmental protection count with *any* of the candidates?

Jerry Brown (still running at press time) may be a true environmental candidate — he certainly speechifies like an activist, full of righteous indignation and without a shred of irony or humor. He may have been effective, too. According to a profile by the League of Conservation Voters, as a two-term governor of California "Brown convinced people that there were limits [to growth] and that many of those limits were already under considerable strain." Would that those two other guys could take a page from Brown's book.

An April 28 piece by the *New York Times* reports that President George Bush "is attacking environmental rules with a fervor not seen in Washington since the earliest days of the Reagan Administration." (See: backing the coal industry's efforts to dismantle the strip mining law; attempting to weaken the hazardous waste law; altering enforcement rules for the 1990 Clean Air Act.) Don't believe everything you read in the *Times*? Consider this: In a first term overview, Bush got a "D" from the League of Conservation Voters.

Most environment-related reviews put Arkansas Governor Bill Clinton ahead of the President, but only slightly. In his

defense, Clinton has been prospecting ways for forging links between ecology and jobs — even as Bush acts like economic growth and environmental protection are incompatible. But then there's that embarrassing 1991 survey of states' environmental performance by the Institute for Southern Studies, where Arkansas rated dead last in environmental protection and enforcement.

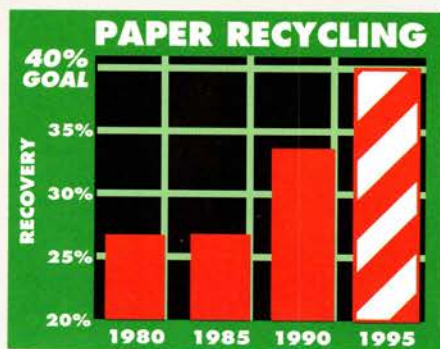
That would be nice. (Seriously.) Why not let the rhetoric take them past election-year agendas and into cleaner water and land and air? (Don't hold your breath.)

So now you know how to vote, right? Nah, me neither.



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The coiners of the term, Dan Knapp and Mary Lou Van Deventer, define MSD as "the supply of resources available to the recycling industry for processing and sale." In their forthcoming book entitled *Total Recycling: Realistic Ways to Approach the Idea*, they go on to suggest ways to work the term into your vocabulary, like:

"If recycling can dispose of only 75 percent of the discards, the rest will have to be wasted."

"The extent to which waste can be reduced varies greatly by industry, and it is not yet known what percentage of discards can be diverted from waste."

The authors also propose that the term "wasteshed" (a garbagy perversion of the term watershed) be replaced with "supply shed."

These semantic antics herald a new paradigm in waste-management policy — oops, that's *materials*-management policy — a paradigm in which we recognize in our garbage the weighty investment of energy and natural resources that ought not be written off after only one use.

Mm

